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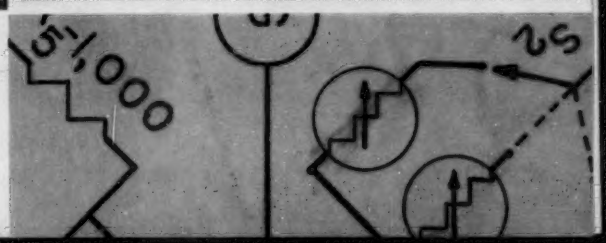


ND FACTS

YOUR KEY TO SAVINGS IN THIS IDLER PULLEY UNIT IS

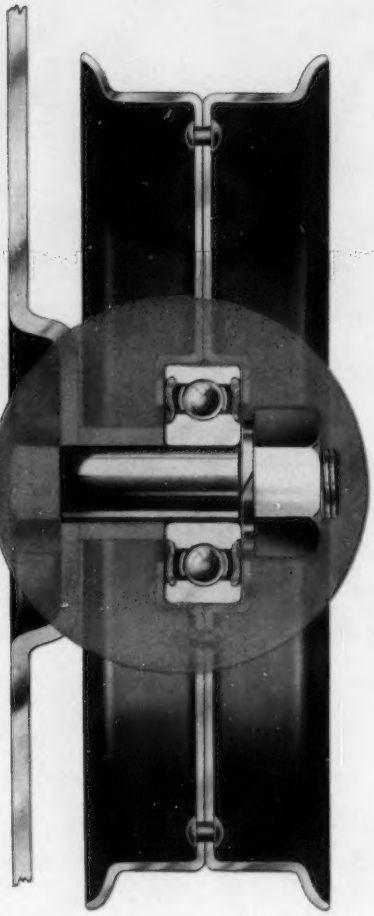
SIMPLICITY

Simplicity starts at the hub of these New Departure idler pulley units . . . with Sentri-Seal ball bearings.

Sentri-Seal bearings are performance-proved . . . sealed and lubricated for life. *No* need for grease fittings or periodical lubricating. Economies thus gained are applied to the *sturdy construction* of the riveted pulley, where manufacturing refinements such as *rolled sheave edges* provide extra strength and prevent belt damage.

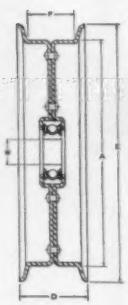
Mounting is easy, too. *Bearing bore sizes fit standard machine bolts* and since they require no maintenance attention the units can be mounted in inaccessible locations. Nothing could be *simpler—more economical.*

Write today for complete information on New Departure's two series of idler pulley units—PF Series for flat belts, PV Series for use with standard "B" Section V-belts.



Shown here is New Departure PF Series idler pulley unit for use with flat belts or backside V-belts.

SENTRI-SEAL
ON GUARD AGAINST DIRT

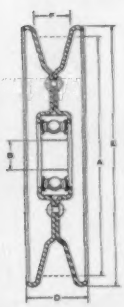


PF SERIES

PRINCIPAL DIMENSIONS

Unit No.	Eff. O.D. A	Sheave O.D. E	Sheave Width D	Mounting Bolt Diameter **B	Belt Width or Max. Groove Width F
*PF2-212	2.75	3.25	1.076	½	.700
PF2-400	4.00	4.50	1.375	½	1⅛
PF2-500	5.00	5.75	1.562	½	1⅛
PF3-600	6.00	6.75	1.590	⅜	1⅛
PV2-404	4.25	4.875	1.094	½	.737

*Idler unit PF2-212 is hardened to provide long life when used on chain drives.
**Standard machine bolt, hex head recommended.



PV SERIES

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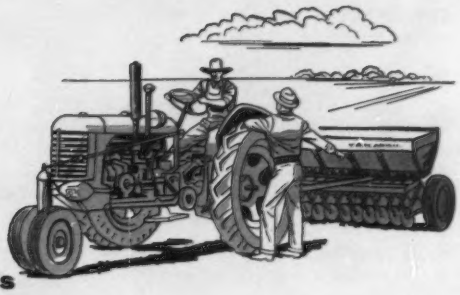
DIVISION OF GENERAL MOTORS, BRISTOL, CONN.
NOTHING ROLLS LIKE A BALL

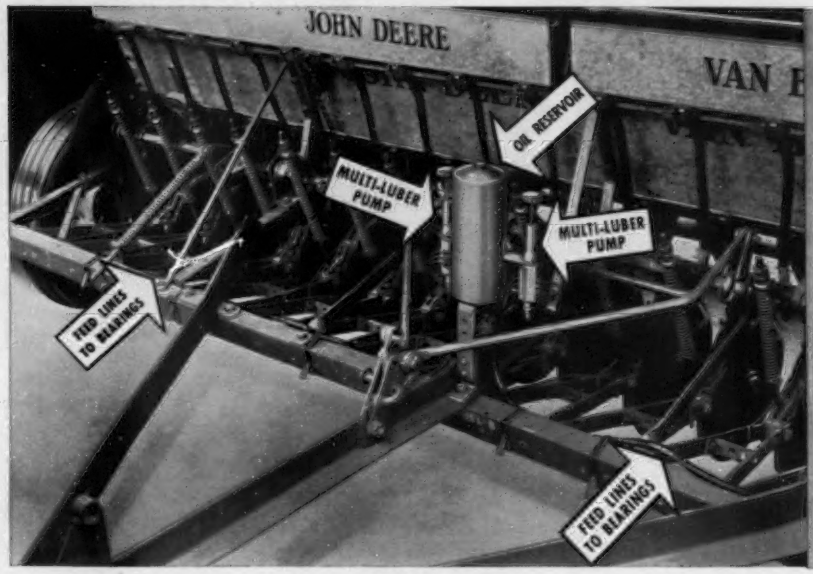
(For more facts circle No. 5 on reply card)

Lincoln pushbutton power lubrication for farm implements

- Eliminates oiling and greasing time in the field
- Assures more productive work per daylight hour



Assures Positive Pressure Lubrication in Seconds . . . Extends Bearing Life . . . Increases Machine Efficiency . . . Pays for Itself in One Season



Disk bearing life for John Deere Van Brunt Company Grain Drills is infinitely prolonged through metered positive pressure lubrication to each bearing. Lincoln Multi-Luber Systems save labor by eliminating need for individual lubrication of furrow openers . . . save time and trouble by using same oil as used in the tractor crankcase.

easy to use . . . simple to install . . . precision built to last!

Lincoln Multi-Luber* power lubrication system permits simultaneous lubrication of all bearings in seconds . . . on such farm equipment as corn pickers, combines, manure spreaders, mowers . . . any implement having multiple bearing points. Provides proper, frequent lubrication . . . flushes bearings as it lubricates . . . pays for itself quickly.

Either manually or power operated, the Multi-Luber System is an injector pump that dispenses measured amounts of oil from 12 outlet ports through sealed tubing, to the bearings. The net result is a sharp reduction in costly lubrication time . . . with overall improved field performance.

Write today for full details!

*Trade Name Registered

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Note: AGRICULTURAL ENGINEERING is regularly indexed by Engineering Index and by Agricultural Index. Volumes of AGRICULTURAL ENGINEERING, in microfilm, are available (beginning with Vol. 32, 1951), and inquiries concerning purchase should be directed to University Microfilms, 313 North First Street, Ann Arbor, Michigan.

AGRICULTURAL ENGINEERING is owned and published monthly by the American Society of Agricultural Engineers. Editorial, subscription and advertising departments are at the central office of the Society, 420 Main St., St. Joseph, Mich. (Telephone: YUkon 3-2700).

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SUBSCRIPTION PRICE: $5.00 a year, plus an extra postage charge to all countries to which the second-class postage rate does not apply; to ASAE members anywhere, $3.00 a year. Single copies (current), 50 cents each.

POST OFFICE ENTRY: Entered as second-class matter, October 28, 1933, at the post office at Benton Harbor, Michigan, under the Act of August 24, 1912. Additional entry at St. Joseph, Michigan. Acceptance for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized August 11, 1921.

The American Society of Agricultural Engineers is not responsible for statements and opinions advanced in its meetings or printed in its publications; they represent the views of the individuals to whom they are credited and are not binding on the society as a whole.

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Plan ASAE Meeting During World's Fair

SEVERAL ASAE members, including President E. G. McKibben and Executive Secretary J. L. Butt, have announced their plans to attend the 5th International Congress of Agricultural Engineering to be held September 29 through October 4 during the World's Fair in Brussels. Reports to ASAE Headquarters have indicated that at least 15 ASAE members from the United States will attend the Congress, most of whom have submitted papers for possible presentation. Other ASAE members from countries throughout the world are expected to attend.

The aim established by the Congress is "to stimulate the science and the techniques of agricultural engineering, as well as the use of these techniques; and to coordinate scientific research and techniques in the fields related to agricultural engineering." The Council of ASAE, during the Annual Meeting of the Society at Santa Barbara, Calif., encouraged participation in the Congress by its members and designated J. L. Butt, as executive officer of the Society, as its representative to establish a direct contact with the international organization and other agricultural engineers throughout the world. The Council felt that participation by ASAE would strengthen coordination of agricultural engineering as a profession and lend support to the objectives set forth by the Congress.

Both President McKibben and Secretary Butt have announced that they are anxious to meet as many ASAE members from other countries as possible during the Congress and are hopeful that a brief meeting of those in attendance might be arranged. All ASAE members planning to attend are urged to get in touch with J. L. Butt, ASAE, 420 Main St., St. Joseph, Mich., as soon as possible so that arrangements might be made for a "get acquainted" session.

In response to an invitation for contributions to the Congress, it has been reported that the following papers have been submitted, subject to approval by the respective program chairmen:

Progress in Mechanizing U.S. Farm and Farmsteads, by W. M. Carleton and Wallace Ashby

Stress Distribution in Soil Under Tractor Loads, by A. W. Cooper

The Responsibility of Public Agencies for Farm Machinery Research, by E. G. McKibben

Prediction of Tractor Performance by Use of a Digital Computer, by W. H. Worthington

Evaluating the Performance Characteristics of New Tractor Models, by L. W. Hurlbut

Criteria for the Design and Development of Farm Equipment, by K. D. Butler and R. R. Raney

Current Concepts and Developments in Erosion Control Research in the U.S., by D. D. Smith

Swine Growth and Efficiency in a Naturally Varying Environment, by T. E. Hazen, N. H. Curry, and H. Giese

Determining Irrigation Requirements from Consumptive Use (Evapotranspiration) Rates, by H. F. Blaney

The Transmission of Water and Air by Soils as Influenced by Soil Chemical and Physical Properties, by R. C. Reeve

Livestock Environmental Control, by C. F. Kelly

Diversity of Maximum Demands of Farm Electrical Equipment, by L. F. Charity

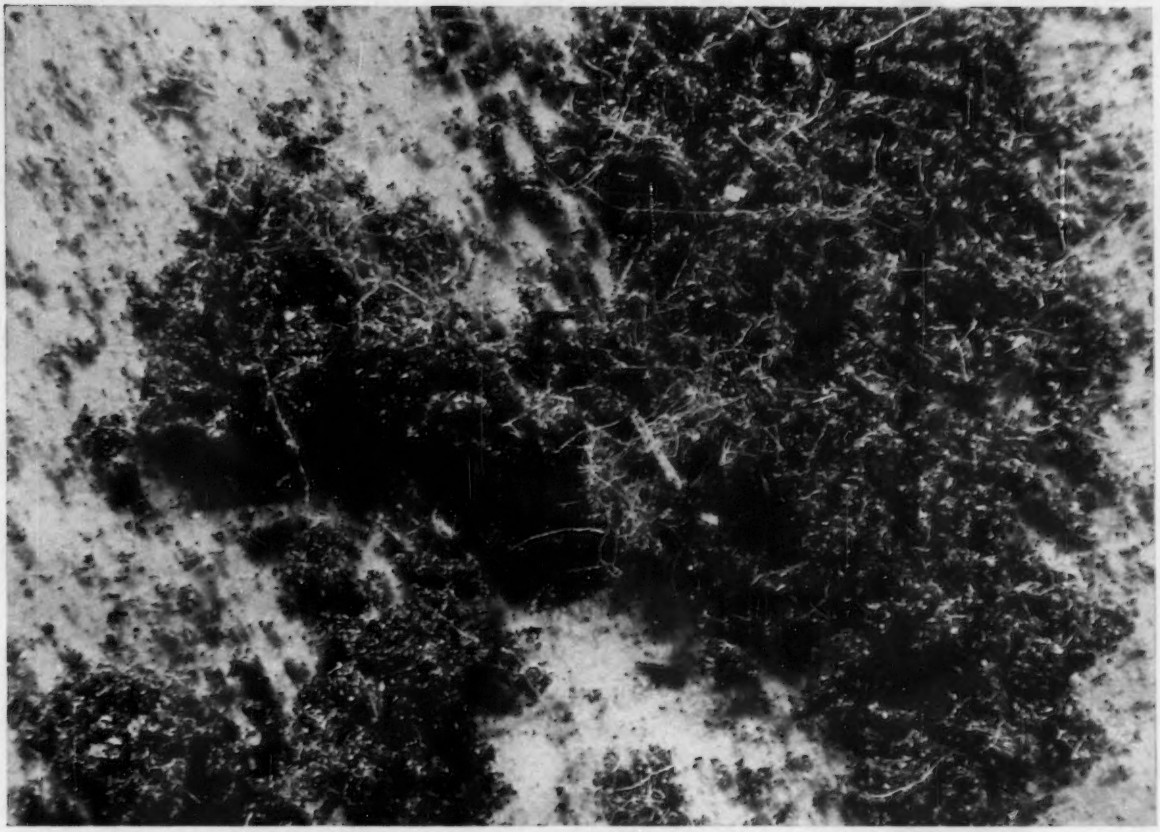
Electric House Heating and Distribution System Demands, by L. F. Charity

Drainage Practices in the United States, by J. G. Sutton

Land Shaping for Irrigation, Drainage, Erosion Control and Efficient Farm Management, by J. W. Borden (or his representative)

Research on Water Conserving Practices in the Great Plains of the United States, by M. E. Jensen

Materials Handling Concepts and Applications in the United States, by C. W. Hall.



Actual photograph of dirt and dust removed from the diesel fuel system of the **CASE. *400*** by the second stage filter. Particles shown are magnified approximately 30 times.

TRAPPED! Diesel Enemy No. 1

When Case engineers began development of the now-famous "400" diesel engine, one of the problems was to develop a fuel filtering system which would protect injectors with tolerances as fine as 39-millionths of an inch. Ten years of research and testing finally produced the first really dirt-proof filter system for diesel engines. It will stop particles down to 5 microns in size (.0002").

The unique Case 6-point filtering system traps Diesel Enemy No. 1 at these six points: (1) breather-cap filter—seals out dust and dirt at the air vent; (2) fuel tank—fine-mesh filtering screen removes dirt when refueling; (3) water trap—collects moisture and sediment; (4) first-stage filter on fuel line; (5) second-stage filter; and (6) final-stage filter.

Six point diesel fuel protection is just one reason why the Case diesel engine sets the pace the world over for outstanding performance, longer life, and maintenance-free operation.

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WHITNEY SELF-LUBE AG CHAIN

keeps farm equipment continuously operating without chain maintenance.

Under conditions of extreme dust or mud, it will outlast regular chain by as much as five to one.

SECRET? *Exclusive*, high strength Sintered Steel Chain Bushings, *pre-lubricated* for life . . . Whitney engineered and completely proven by long hours of extensive field service.

Whitney's Sintered Bushings are designed to provide film-oiling from within their cores in ratio to operating loads. The tougher the usage, the more lubrication to vital chain parts.

And Whitney Self-Lube Ag Chain is self-cleaning . . . controlled clearances eliminate trapping of ruinous abrasive materials and prevent "freezing" of chain joints. It's "the chain that maintains itself!"

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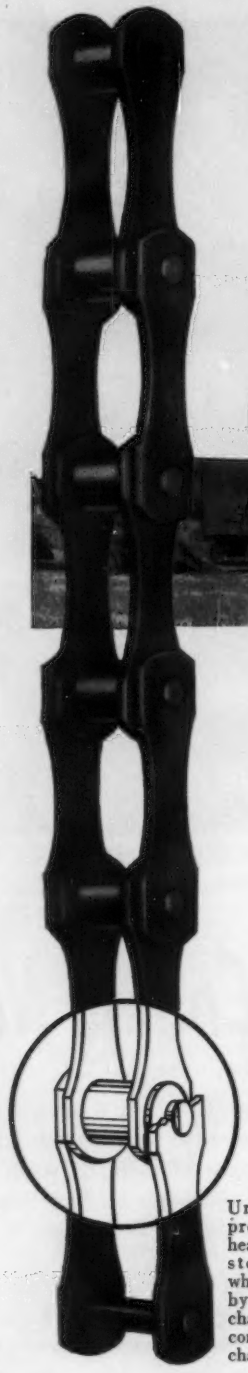
Your customers profit by the time and money saving benefits of Whitney Self-Lube Ag Chain. Whitney nation-wide consultant engineering service is promptly available to assist in determining the chain best suited to your requirements. If you want *results* specify WHITNEY CHAIN.

Write for free technical brochures.



Under operating pressures bushing heats and releases stored lubricant which is reabsorbed by bushing when chain is idle. Cycle continues for life of chain.

CREATORS OF SELF-LUBE AG CHAIN

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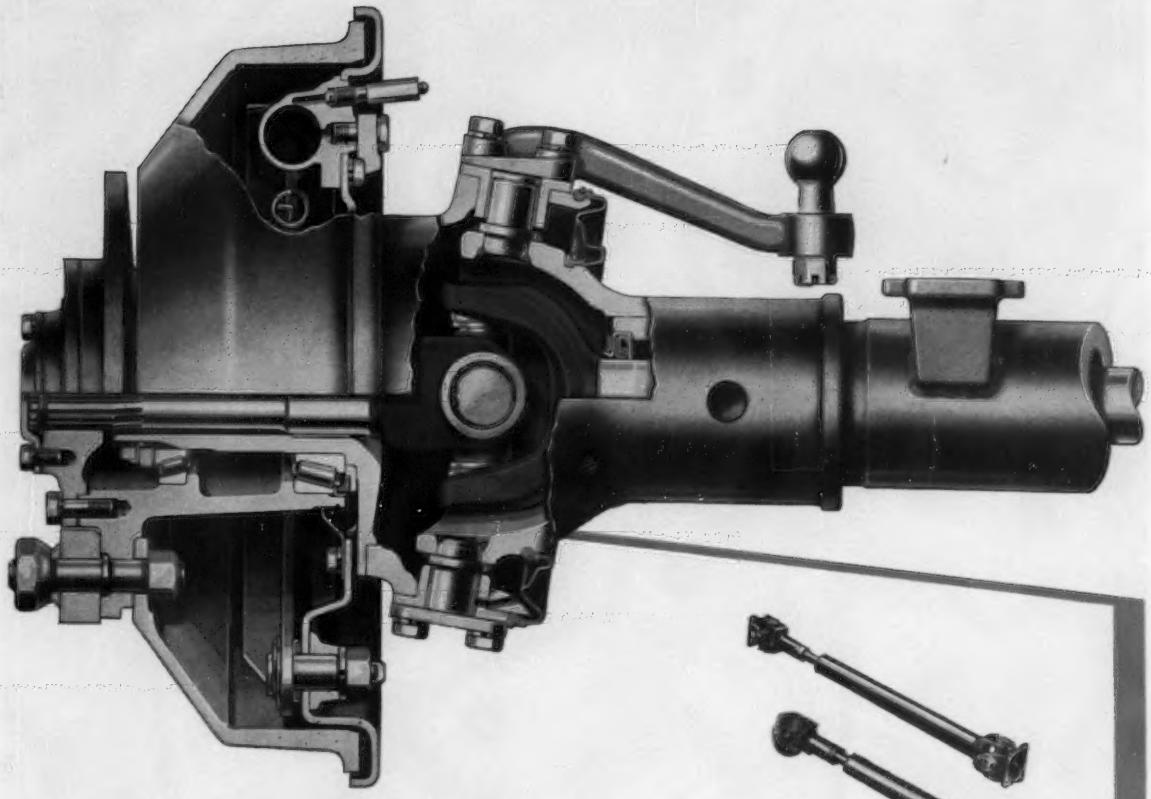

For a better front-driving axle, get this Timken-Detroit FDS-750

equipped with

BLOOD BROTHERS Universal Joints

Here's another example of Blood Brothers' engineering cooperation . . . to produce ever-better truck components.

When this major axle source wanted an improved front-driving unit for a truck-building customer, their engineers and ours got together. The result shown above now provides users of famous brand trucks with *substantially increased capacity* on their front-driving axles.

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For a quick review of our products, request Bulletin 557.

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SINGLE AND DOUBLE JOINTS FOR POWER TAKE-OFF USE

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Installing fertilizer feed cup receivers and tubes made of Armco ALUMINIZED STEEL. Small photo shows close-up of finished parts. They need no painting for corrosion protection.

Why Armco ALUMINIZED STEEL Improves Farm Equipment, Cuts Production Costs

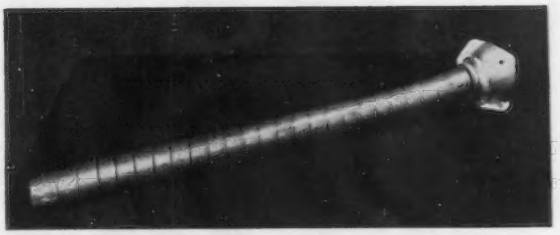
Agricultural engineers are designing more and more Armco ALUMINIZED STEEL into farm equipment parts to assure longer service life, cut production costs.

For example, one of the largest manufacturers of farm machinery now uses Armco ALUMINIZED STEEL Type 2 fertilizer feed cup receivers and tubes for grain drills. These parts were formerly made of galvanized steel and painted. ALUMINIZED STEEL needs no paint for corrosion protection . . . eliminates a costly operation.

Longer Service Life

This special steel has a tightly adhering aluminum coating applied by a patented continuous hot-dip process. Because of its excellent resistance to atmospheric corrosion, ALUMINIZED STEEL provides longer service life for many parts and products that are used out-of-doors.

For complete information on the properties of Armco ALUMINIZED STEEL Type 2, just fill in and mail the coupon. Or call your nearest Armco Sales Office.



New steels are born at Armco

ARMCO STEEL CORPORATION, 2218 Curtis St., Middletown, Ohio

Send me complete information on Armco ALUMINIZED STEEL. We manufacture_____

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POSITION

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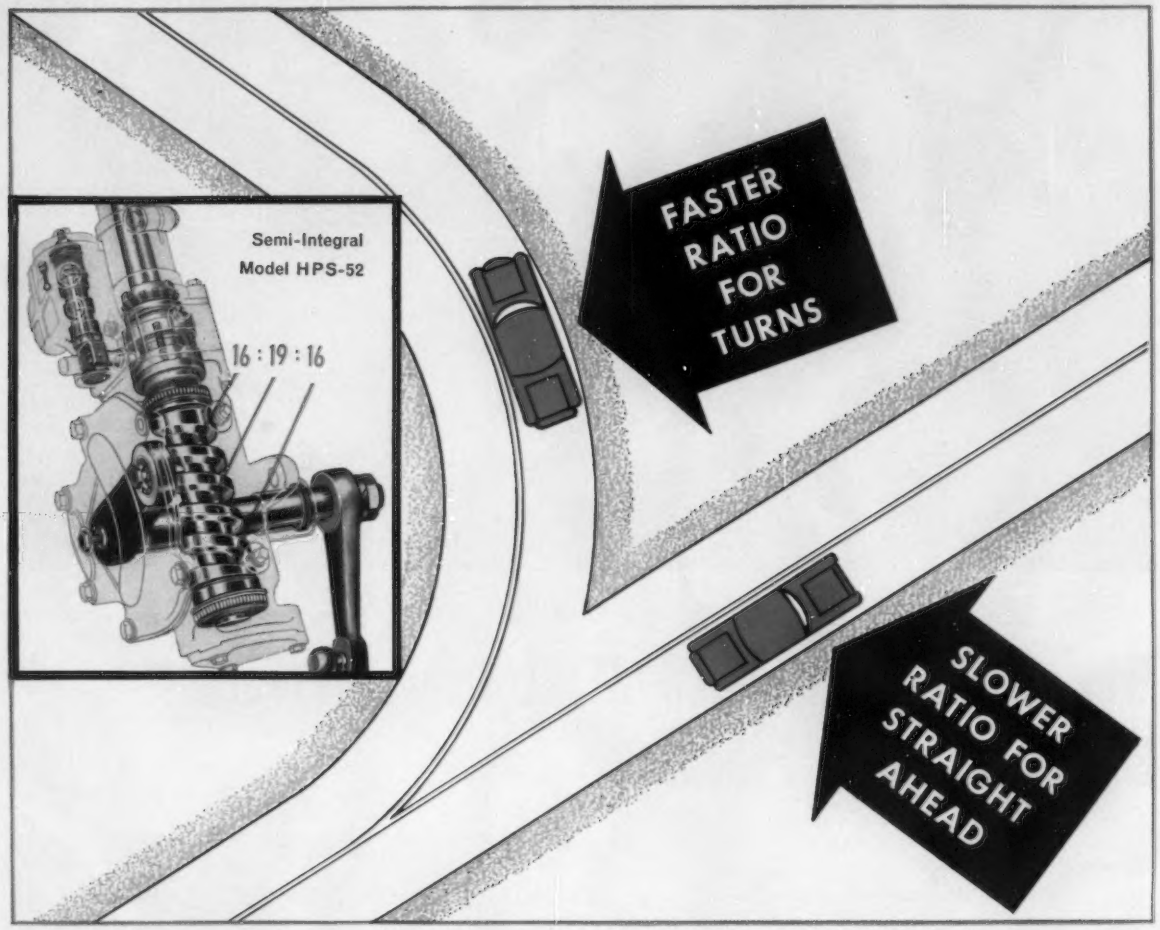
ROSS Variable-Ratio Steering



▶Faster steering and quicker recovery for *turns!* Slower steering and almost hands-off stability for *straight-ahead!*

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Report to Readers . . .

THE FARM SHOP TAKES ON NEW IMPORTANCE IN MACHINE AGE

This is the view of two agricultural engineers at the University of Wisconsin, who have been taking a look at farmers' shop facilities and what the possibilities are for improving them. These engineers report a growing awareness on the part of farmers they surveyed that a well-equipped shop is needed to enable them to do more of their own repair work and minor building and thereby reduce their over-all operating costs. . . . The anvil, hand forge, and other hand tools typical of an earlier-day farm shop are now giving way to electric hand drills, power saws, abrasive wheel grinders, air compressors, soldering irons, hoists, arc or gas welders, table saws, and other power tools in the good farm shops of today. . . . The Wisconsin survey showed that the majority of farmers with well-equipped shops built their own portable hog houses, wagon racks, feed bunks and other equipment out of wood, but that relatively few attempted to build such equipment as feed mixers, elevators, or auger self-feeders. Also, many farmers do their own engine tune-ups, and a few have the tools to do complete machinery overhauls. . . . A major handicap to a large percentage of farmers in making fuller use of a farm shop – if they have one – is in the lack of time to utilize it. This is especially true during periods when regular field operations are demanding attention, and also at other times because of the time required for daily chores.

FERTILIZER HOPPERS THAT WONT CORRODE – A BOON TO FARMERS

While relatively a small thing in the vast array of equipment that a farmer needs, we suspect that one item he appreciates out of all proportion to the amount he has invested in it is the lightweight translucent plastic fertilizer hopper. These hoppers are made of reinforced fiberglass and are designed for use on planters and cultivators. They will hold approximately 115 pounds of commercial fertilizer and are rust and corrosionproof. The fact that they are translucent permits the farmer to check the flow of fertilizer without stopping his equipment for occasional checks.

NEW BRIDGE BREAKER AGITATES MATERIAL INSTEAD OF SUPPLY DUCT OR CONTAINER

What appears to be a definite improvement in means for breaking the bridging of materials in storage bins, supply ducts and containers has been developed by a scale manufacturer. What makes this device particularly noteworthy is that it agitates the material to be conveyed rather than the bin or duct containing it. . . While vibration is used, it is not applied directly to the sidewalls of the hopper or duct, but rather to screens inserted within the chamber and extending downward to the discharge outlet. With this device, it is necessary to agitate only a small mass of steel to break any bridging of material between the sidewalls of the container. This bridge breaker has a particular advantage in weighing operations where a constant flow is required between storage hoppers and scale feeders.

STEEL INDUSTRY ENHANCES "LUSTER" OF FARM LIVING WITH COLOR-COATED BUILDING PANELS

Perhaps the most distinguishing characteristic of altogether too many farmsteads has been their drabness. It must be said, however, that more recently farm families, in one way and another, have made much progress toward improving this condition. However, of all the things that could be done to brighten up a farmstead, there has been nothing capable of working such magic as paint – and certainly farmers have been buying a lot more of it than they did in the horse-and-buggy days. . . . But from now on paint is going to have to face a strong competitor, especially with respect to its use on structures other than homes. According to a recent announcement by one of the steel companies (Stran-Steel), galvanized steel building panels can now be pur-

chased with a durable, low-cost, factory-applied color coating. And buyers are offered a choice of six colors, as well as the standard metal finish. This color coating is not a paint; it is a two-layer coating of vinyl-aluminum said to be more durable and lower in cost than paint. The coating is applied to the steel panels at the factory. Rigorous exposure tests of this coating show no deterioration of the finish coat, no loss of adhesion, and no corrosion of the base metal. Also, the coating will not blister, peel, crack, or fade. . . . This new coating may well prove to be an important factor in further stimulating the farm and general rural market for steel buildings.

ENGINEERS RECOMMEND THE CANTILEVER TYPE AS BEST CONSTRUCTION FOR A BUNKER SILO

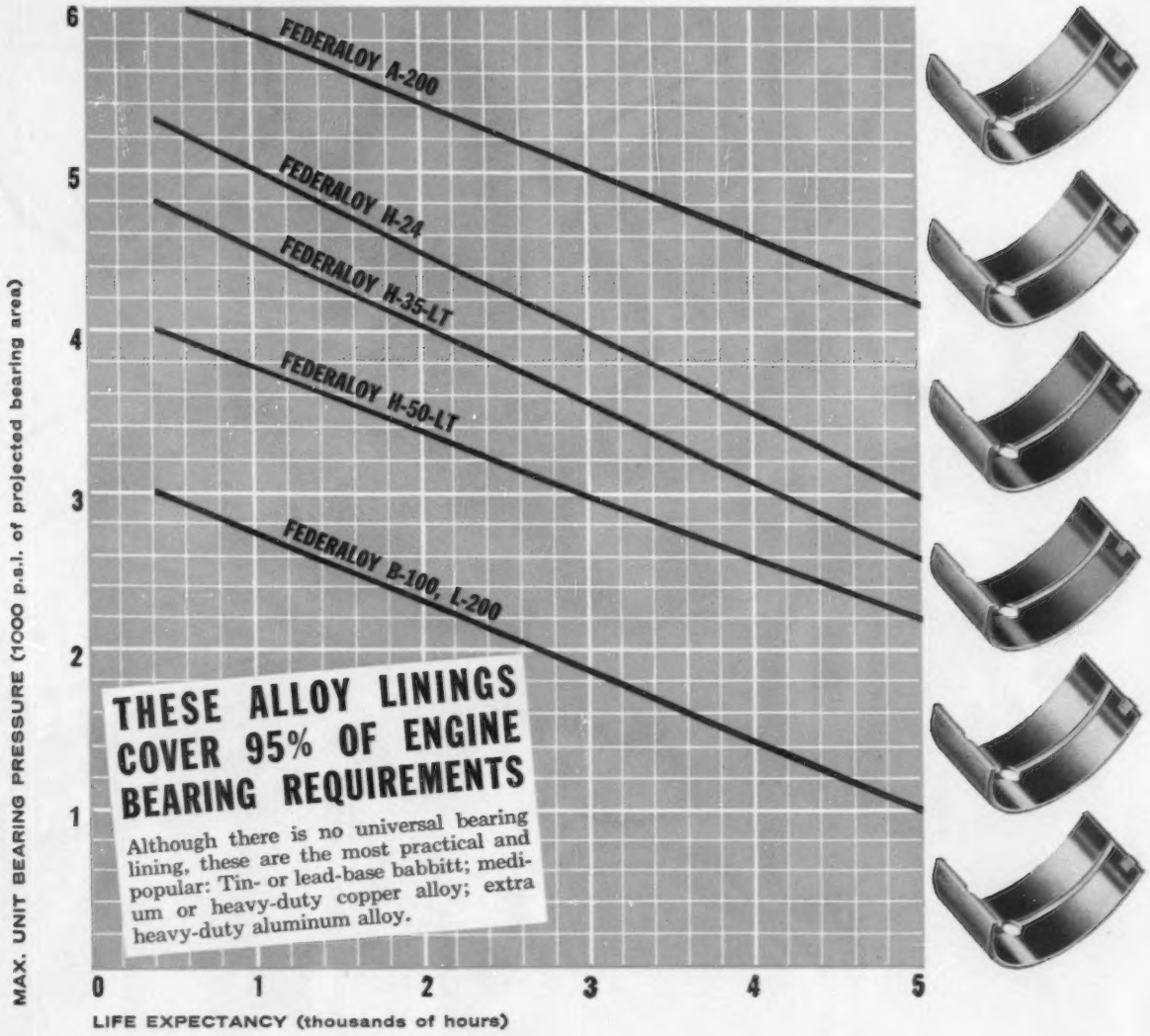
As a result of studies conducted by agricultural engineers at one of the University of Minnesota's branch experiment stations, these engineers are of the opinion that the cantilever is the best construction type for a bunker silo. In these studies it was found that silo walls of the cantilever type deflected a little during the first year of use, but that thereafter little deflection was evident. . . . In the particular structure studied, posts were set 4 feet apart in a concrete floor, and no additional bracing was provided. Not only was this structure neat in appearance, but it had the additional advantage that it was easy to work close to it with a mower or other implement, since there were no braces extending out from the upright posts. . . . In the construction of this silo 10-foot posts, 6 inches in diameter at the top, were set 4 feet in the ground (and 4 feet apart) through holes in the concrete floor. The floor was built to slope one inch in every 4 feet, from the center to the walls, to allow the juice from the silage to drain to the sides. Also a one-inch gap was left between wall and floor, which permitted good drainage and did away with high-moisture silage along the floor.

NEW ANTISEPTIC WHITE CORE DEVELOPED FOR PLASTIC PIPE

After years of research, one of the rubber industry units recently announced a significant improvement in the development of flexible plastic pipe for farm and other users of water, which assures hospital clean, antiseptic conditions for conveying water or other liquids for human consumption. In the manufacture of this pipe, a pure white polyethylene core is used, to which carbon black has not been added. Also, it has been possible to reduce the manufacturing cost of this pipe without sacrificing wall thickness, pipe weight or bursting strength. . . . . Other advantages of plastic pipe for farmstead purposes are that it is not subject to corrosion, and it does not collect scale, rust and dirt on account of roughness of bore.

SILO SOLD IN TWO-BY-FOUR-FOOT CARTON WILL HOLD UP TO FORTY TONS OF SILAGE

Yes, it's a plastic silo, made of a specially formulated agricultural film which seals off air and moisture penetration, thereby virtually eliminating spoilage of silage. The vinyl film (or liner) is in the form of a sleeve 14 feet in diameter which is placed inside a circular section of 4-foot galvanized steel fence to hold the liner in place. After this section is filled with silage to the height of the fence, another section of the fence is placed above it and the liner filled to fence height. When filled to its three-section capacity, it contains about 40 tons of silage. The vinyl liner is then drawn together at the top and fastened with baling twine. The sleeve unit costs approximately $140 and the manufacturer estimates a life expectancy for it of approximately three years or five fillings, also that its cost can be written off in one year. . . . In view of the amazing success some farmers are reporting from their experience with green-chop feeding of cattle as compared with pasturing, it is likely that this practice will become increasingly popular with farmers. A portable silo of the type mentioned would fit well into this practice by providing temporary storage for surplus forage that has reached prime condition for harvesting.



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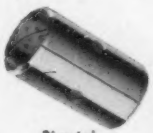
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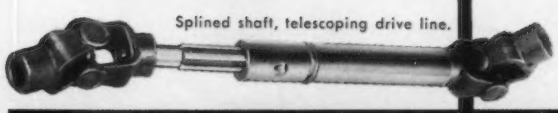

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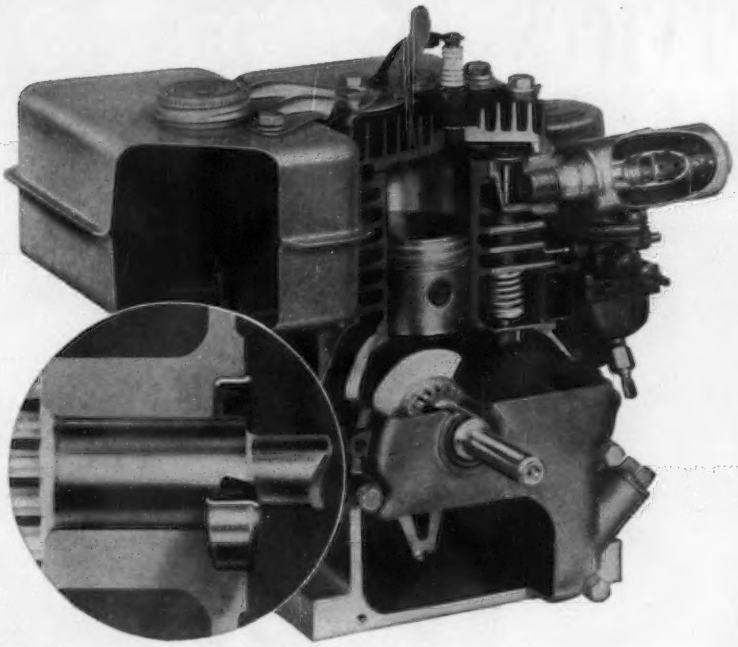

Figure 1.

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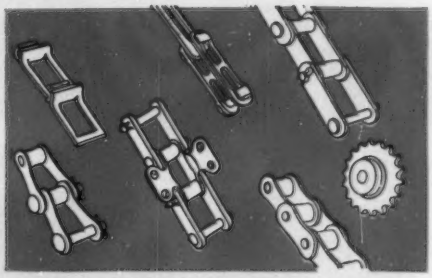

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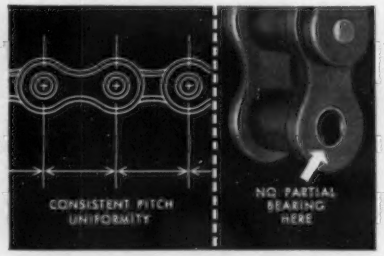

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Agricultural Engineering

James Basselman, *Editor*

July, 1958
Volume 39
Number 7

Charting the Second 50 Years

AS WE plan for the next 50 years of professional development and service to agriculture it seems appropriate that we review briefly our rich heritage and set some new goals for attainment.

The founders wisely chose a descriptive name for our Society and destined that its members, first of all, be engineers if they are to solve the engineering problems in agriculture. Just as the chemical engineer is especially qualified to serve the chemical industry by virtue of his background in engineering and chemistry, so the agricultural engineer is especially fitted to serve agriculture because of his basic engineering training and special background in the natural and biological sciences.

Prestige for any profession must begin in the college classroom. It is understandable that setting up a curriculum which would be acceptable to both supervising deans, as is usually the case for agricultural engineering, has not always been an easy task. But there can be no compromise with setting and maintaining high standards in the professional dicipline. The members of our Education and Research Division have performed a real service in setting up certain minimum standards in basic engineering training. This has helped to provide assurance to prospective employers, of a uniform engineering training of graduates from our professional courses. It has helped also to eliminate wide differences in background and training of graduates who at different institutions might both be called "agricultural engineers," but whose capabilities might lie in widely separate areas. Today we have 47 professional curriculums recognized by the Society. But if we are to progress professionally our curriculums must merit full recognition by engineers of other branches of the profession. Fortunately progress is being made in this direction. The Engineers Council for Professional Development has approved 25 of our professional curriculums. This compares with only five in 1949 and 15 in 1950. No college or university department can stop short of the goal of meeting these minimum standards.

Teaching methods must also take advantage of new and modern techniques if our students are to assimilate the rapidly expanding fund of scientific knowledge in the brief four or five-year span of their basic college training. The Ferguson Foundation has generously supported teaching seminars

Annual address of the president of the American Society of Agricultural Engineers before the 51st Annual Meeting of the Society, Santa Barbara, Calif., June, 1958.

EARL D. ANDERSON
President of ASAE, 1957-58, and director, Agricultural Extension, Stran-Steel Corp., Detroit, Mich.

in the past in recognition of this need. But with changing personnel among the college staffs there is a continuing need for teacher training. This need has been recognized by the other engineering branches, and facilities are provided for such training through the American Society for Engineering Education. We are not taking full advantage of the opportunities provided by this society at the present time. I have two recommendations to the officers and members of our Education and Research Division: *(a)* that membership in A.S.E.E. be promoted among those of our members who have chosen a teaching career and *(b)* that a constructive meeting program be planned in the agricultural engineering field for presentation at the next annual meeting of A.S.E.E. which will be held in Pennsylvania next June. Much professional stimulation will be gained also from attendance at the general sessions of this organization.

The record shows significant advancement in graduate training in agricultural engineering. In 1957, 173 students were working toward the masters degree and an additional 54 were pursuing the doctorate. Comparable data for 1940 showed only 42 and one, respectively.

Members of our student branches deserve recognition for progress in scholastic attainment with increasing numbers being elected to honor societies. Likewise, there has been a noted and continual improvement in variety and participation in extra-curricular campus activities and in participation in the student paper award competition. We congratulate these professional leaders of tomorrow.

Engineering Unity

In a meeting with the presidents of the other major engineering societies this year I became acutely aware of the need for our Society to become more closely identified with the other national engineering societies if we expect to progress professionally with them. The time to initiate this policy is when our membership passes the 5000 corporate member mark entitling us to full membership in the Engineers Joint Council along with the so-called "Constituent Societies". The strong feeling of need for an over-all organization to speak nationally for engineers was expressed by the presidents at the above mentioned meeting. This will lead, we confidently believe, to an early merger of E.J.C. with other organizations representing engineers on a national basis. At the invitation of E.J.C. we have recently appointed members to serve on several important committees dealing with national problems. We should be alert to future opportunities to influence policies at the national level as they affect engineering aspects of agriculture — the field in which we are particularly qualified.

Professional Recognition

In the field of registration we should be closely affiliated with another engineering group, the National Council of State Boards of Engineering Examiners. A survey last year revealed that our members may be registered as agricultural engineers in 26 of the 48 states. In nine states they could register as civil or mechanical; in three states all engineers were classified only as "professional engineer" and in one state only civil engineers could be registered. The status in the remaining nine states was not established by the survey. Efforts must be increased to attain agricultural engineering recognition for registration purposes throughout the country as a part of professional development of our graduates. We are proud that two of our members are serving as executive secretaries of their state professional engineers organizations.

The special qualifications of agricultural engineers are being recognized by a growing number and variety of employers who contact the Society's personnel service in their search for employees. Also many of our members are advancing into executive positions. This is true in industry and in public service where members are moving into administrative positions in the colleges of engi-

(Continued on page 415)

Gear Design for Finite Life

H. A. McAninch
Member ASAE

Data gathered from calculations and tests in the laboratory and field provide important design information for determining necessary finite life for various gearsets used in farm machines

GEARS, like other farm machinery components, must be designed to withstand the rough treatment to which farm machines are submitted during normal and extreme operating conditions, but not to last forever. This paper deals with the application of bevel gears to rotary cutters, pickup balers, posthole diggers and manure spreaders.

Manufacturing Methods

First consideration is given to methods of manufacturing, because of the effect manufacturing has upon the strength of gears. Oldest and most common is the shaping method, whereby reciprocating cutters and the gear blank are rotated and rocked in synchronization to produce a desired involute. In this operation the cutters perform in exactly the same manner that the tooth of the mating member would mesh. This operation is preceded by a roughing or notching operation which reduces the amount of material to be removed while shaping. The notches can be cut with a formed milling cutter where usually there is a mismatch between the roughing and the finish cut. Also, the roughing depth is always greater than the finish cut. This extra depth and mismatch cause a stress raiser condition not present in the other two common methods of manufacture.

The second method is the revacycle, where a single revolution of a formed milling cutter produces a finished tooth space in one revolution. This is a high-speed operation, but due to the cost of the necessary tools, this process is warranted only by large production quantities. This method of gear manufacture produces a maximum radius in the root of the tooth. Gearing of this type is used extensively in differential pinions and side gears. Pressure angles are in the range of 22½ to 24 deg.

The third method of producing straight bevel gears is with two interlocked rotary cutters. This method of cutting produces coniflex gears. This type of gear has a localized bearing central on the tooth which eliminates edge contacts on the gear teeth. When gear bearings are kept off the edge of the teeth, the bending strength and resistance to tooth pitting are increased to a large degree. If strength calculations are to be valid, the tooth mating must be controlled. Both the revacycle and coniflex methods of gear cutting allow improved control of tooth bearing; thereby, obsoleting old reciprocating machines from both a quality and quantity viewpoint.

Paper presented at the Winter Meeting of the American Society of Agricultural Engineers in Chicago, Ill., December, 1957, on a program arranged by the Power and Machinery Division.

The author — H. A. McAninch — is vice-president and manager of product development, Warner Automotive Division, Borg-Warner Corp., Auburn, Ind.

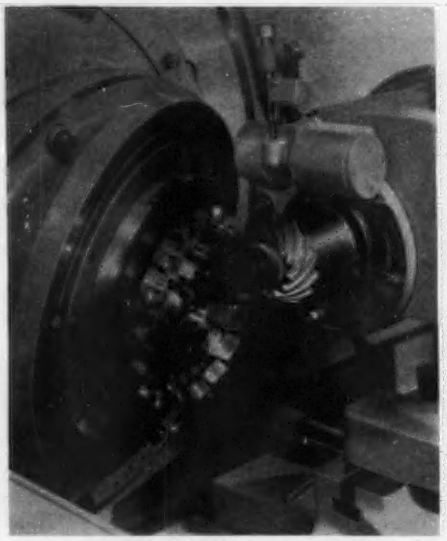

Fig. 1 Generated gears and pinions and formate pinions are finish cut on machines of this type. Shown is a No. 16 Gleason generator

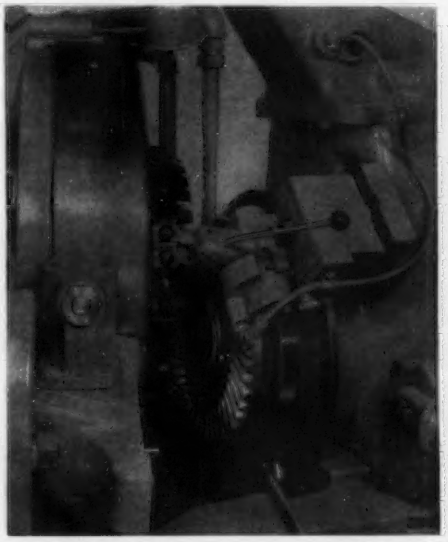

Fig. 2 A close-up of formate gear cutting on a Gleason No. 22 formate machine

The machines used for the production of spiral bevel and hypoid gears are identical. There are two methods of producing these, namely, "generated" and "formate." In the generating process, the gear is notched in a milling operation and then is transferred to a generating machine which is so timed and coordinated that the rocking and rolling action of the work and the cutter produces the desired tooth form. The pinion is roughed or notched on a machine for that purpose, and then, because it is simpler to adjust the pinion tooth profile and spiral, and so that it will be permissible to alter one side of the pinion tooth without disturbing the other, one side of the teeth is finish cut on one machine and the other side on another machine. Fig. 1 shows a No. 16 Gleason generator. This is the type machine on which generated gears and pinions and formate pinions are finish cut.

In the formate method of manufacturing, the gear is roughed by a milling operation and the tooth is then finish cut by the single revolution of a formed cutter. The gear in principle is a rack, and the cutting of the pinion is modified accordingly. The production of the mating pinion for the formate gear is identical in methods used to produce the pinion for the generated gears. The formate and the generated gears differ little in respect to rolling action. A close-up of formate gear cutting is shown in Fig. 2.

Again, the mismatch of the roughing and finishing cuts on generated gears could cause stress raisers in the root area where the bending stresses are a maximum. Another advantage of the formate method is the uniformity of gears from one setup to a later one.

Gears for Rotary Cutters

Over the past several years our model WA47 gear assemblies (Fig. 3) have been used extensively on rotary cutters. Table 1 shows the results of cutting 3¼ to 4-in.-diam yellow pine creosoted posts. In these tests six posts were aligned 8 ft apart and various types of cutters equipped with a torquemeter were pulled across them at a constant speed. It is obvious from the spread of data in Table 1 that the load conditions for gear calculations vary tremendously. If the gearset were engineered for infinite life at 706 lb-ft, it would be too large and not economical for 271-lb-ft service.

TABLE 1. TORQUE LOADS (POUND-FEET) ENCOUNTERED IN CUTTING YELLOW PINE CREOSOTED POSTS PLACED AT 8-FT INTERVALS

(5-ft rotary cutters at 2.5-mph ground speed and 540-rpm PTO speed)

Post size, inches	Std. swing blades	Heavy swing blades	Solid blade	Spring torque dampener	Slip clutch
4	333	381	480	304	451
3½	397	568	382	245	343
3½	451	407	426	436	363
3¼	706	602	461	279	426
3¼	333	568	451	470	333
3¼	578	441	451	—	328
Average	466	496	442	347	374

Post size, inches	Belt drive model	Std. swing blade 1/32-in. edge	Heavy swing blade 1/64-in. edge
4	273	386	233
3½	266	366	273
3½	266	350	350
3¼	306	286	300
3¼	320	333	300
3¼	306	206	167
Average	290	310	271

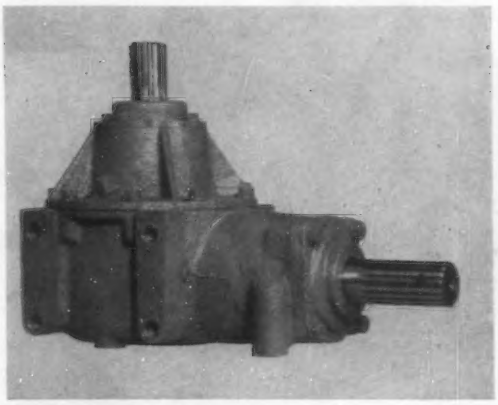

Fig. 3 The model WA47 gear assembly used extensively on rotary cutters designed for use with 40 to 45-hp tractors

To further complicate the conditions for gear design, a typical direct-mounted 5-ft rotary cutter peaks at 350 lb-ft under normal starting conditions. The torque requirements of the same cutter vary from 71 to 315 lb-ft when cutting various grasses.

It is believed that even higher peak torques are encountered when rocks and hardwood stumps are hit by the cutter blades. The cutting of mesquite as practiced in the Southwest produces some extremely high torque conditions on this type cutter. The V-belt drive and slip clutch limit the peak torque values and allow the use of smaller gears without the risk of gear failure.

Beam Strength Design

Our practice for implement boxes has been to design the bevel gears on beam strength only. We do not consider contact stresses or wear life because our assemblies use carburized alloy gears in all cases. We use the Gleason system for calculating beam strengths of bevel gears. (NOTE: Details of gear calculations will not be included, only the results and stress levels used in designing.)

The bending stresses shown in the first two columns of Table 2 were calculated according to the Gleason system. The example given is for the WA47 assembly. The hours life in the last two columns of Table 2 were calculated from a fatigue curve similar to one prepared by the Gleason Works, showing cycles and loads for automotive-type bevel gears. If such a curve is to be used safely, deflections of the gear and pinion must be held to a minimum value. In order to arrive at the gear life shown in Table 2, the number of cycles at a given stress level is selected from the life curve. This number of cycles is converted to hours using the input speed of the pinion and the gear ratio.

TABLE 2. BENDING STRESSES AND HOURS LIFE FOR MODEL WA47 GEARBOX

(15/29 combination, 5 pitch diameter, 22½-deg pressure angle)

Input, hp	Bend stress, psi		Hours life—540 rpm	
	Pinion	Gear	Pinion	Gear
20	12450	13300	Inf.	Inf.
30	18670	19950	Inf.	Inf.
40	24890	26600	Inf.	Inf.
50	31100	33200	185	207
60	37350	39900	58.7	71
70	43500	46600	23.5	38.4

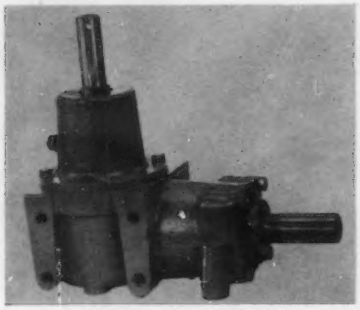

Fig. 4 *(Left)* Model WA50 gearbox designed for use on rotary cutters for 30 to 35-hp tractors

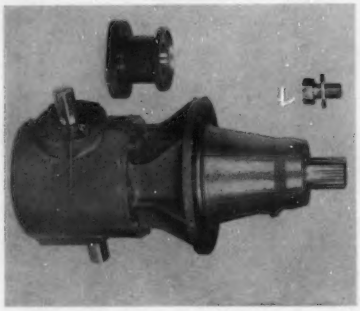

Fig. 5 *(Right)* Model WA57 gearset designed for heavy-duty rotary cutters

The WA50 gearset (Fig. 4) has been used in rotary cutters in the last four years and gear breakage has been nil. In this assembly the gears are stressed higher than the WA47 assembly. The box was originally designed to be used on implements behind 30 to 35-hp tractors. It will be noted from Table 3 that the calculated life is approximately 100 hr at this load level.

TABLE 3. BENDING STRESSES AND HOURS LIFE FOR MODEL WA50 GEARBOX

(15/22 combination, 5 pitch diameter, 22½-deg pressure angle)

Input, hp	Bend stress, psi		Hours life—540 rpm	
	Pinion	Gear	Pinion	Gear
20	20450	20960	Inf.	Inf.
30	31800	32900	135	111
40	42400	43900	26	21.6
50	51200	52400	9.3	7.2

The WA57 assembly (Fig. 5) was designed for heavy-duty rotary cutters. We have established a tractor power output

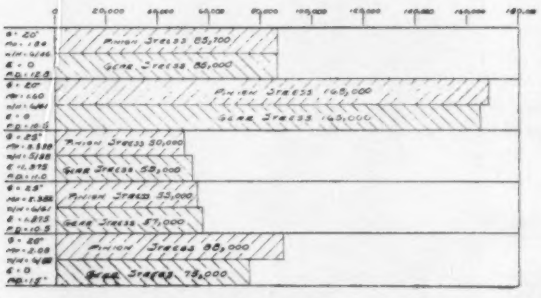

Fig. 6 Calculations used in tests on spiral bevel gears designed for hay balers. Φ = pressure angle, M_p = face contact ratio, P.D. = gear pitch diameter, E = offset, n/N = ratio, T = torque input (11,000 lb-in.)

TABLE 4. BENDING STRESSES AND HOURS LIFE FOR MODEL WA57 GEARBOX

(14/17 combination, 3.5 pitch diameter, 20-deg pressure angle)

Input, hp	Bend stress, psi		Hours life—540 rpm	
	Pinion	Gear	Pinion	Gear
50	32250	41050	102	27.9
60	38600	49400	33	10.8
70	45100	57500	15.2	4.6
80	51500	65600	6.9	2.1
100	64500	82100	2	0.6

of 75 hp for this box. The finite life at this loading, according to Table 4, is less than 10 hr. Again, from several thousand gears in the field in the last two years, there has been no gear breakage. Possibly not enough tractors of high horsepower have been used with these rotary cutters to give sufficient load cycles to cause gear breakage. This gearset has a 20-deg pressure angle and additional gear strength could be obtained by an increase of the pressure angle. This gear cutting was not engineered specifically for this box, but was adapted from an existing application.

In conclusion, it is the author's opinion that approximately 100 hr calculated life for rotary cutters will give satisfactory field life. This statement must be qualified by specifying rigid mounting, alloy steel gears, steel hardenability control, case carbon concentration control, and shot blasting as a finishing operation.

Gears for Hay Balers

In the case of hay balers of the type that use spiral bevel gears driven from the PTO shaft, we have calculated and run tests over several years on spiral and hypoid bevel gears for this service. Fig. 6 shows some of the results of our gear engineering. Service of this type is a little unusual for bevel gears in that the gear takes all the load on the same three or four teeth in every cycle of the baler ram. This loading is quite high because of the stored energy of a flywheel which is mounted on the pinion shaft. Our strain measurements show 11,000 lb-in. to be a fair value to use for gear calculations. All calculations in Fig. 6 are based on 11,000 lb-in.

The 10.5-in. pitch-diameter spiral set of gears in an experimental machine lasted only a few hours. The two spiral sets with stress levels in the 80,000-psi range show some field failures of tooth breakage, always on the gear, and usually with custom operators. The 5-38 hypoid ratio performed without field failures. It is our opinion this stress level of 50,000 - 53,000 psi is conservative. We feel that the stress level can be raised to 70,000 psi if the gear and pinion are rigidly mounted in malleable iron housings and properly supported. The mountings should be such as to limit the ring gear to 0.010 in. out of mesh. The pinion should not lift or depress more than 0.003 in. if full gear strength is to be utilized. It is difficult to approach these limits if gray iron is used in the gear cases because of its inherent low modulus of elasticity. In deflection tests the gear deflections are from two to three times as much for the gray-iron design as for the malleable-iron design. The weight of the two assemblies tested were approximately equal, although the design of housings and ring-gear mountings are quite different.

The baler-gear engineering was not carried on an hour-life basis because of the load cycles coming on a small num-

ber of teeth in the ring gear. The error could be as high as 10 if a cycle basis were to be used. In our opinion, the use of load-limiting clutches, or their equivalent, is almost a must if trouble-free baler gearboxes are desired.

Gears for Posthole Diggers

Another approach to gear engineering for agricultural equipment is found in our WA69 (Fig. 7). This unit is used for a posthole digger. The design basis was to provide a gearset with enough strength to twist a universal joint assembly rated at 7200 lb-in. torque. The ratio was between 3 and 4 to 1, so large augers could be used.

Gear life under a normal loading of 875 lb-in. was to be 500 hr minimum. Using a similar method to the Gleason system of calculation, the stress level in the pinion was 134,000 psi at the 7200 lb-in. input. The level in the gear was 132,800 psi at the same input torque. The pinion life was 3.3 min, the gear life 17 min at the standard 540-rpm PTO speed. Under the average torque condition of 857 lb-in., the pinion and gear life both became infinite. Thousands of these gears have been used in diggers in the field with no gear breakage reported.

Gears for Manure Spreaders

The last implement considered in this paper is the PTO-driven manure spreader. Figs. 8 and 9 show the Model WA66 gearbox which was designed for this service. The problem was to again design a finite life gear. The average unloading time for a spreader was estimated to be 3 min. The average farmer hauled 170 loads per year. A 10-year life was desired for the average farmer; therefore, the finite life must be in the 80 to 90-hr range. Torque measurements show a maximum of 30 hp to start the unloading operation and approaching zero at the end of the unloading operation. Table 5 shows gear life under various load conditions.

TABLE 5. BENDING STRESSES AND HOURS LIFE FOR MODEL WA66 GEARBOX

(13/38 combination, 6 pitch diameter 22½-deg pressure angle)

Input, hp	Bend stress, psi		Hours life—540 rpm	
	Pinion	Gear	Pinion	Gear
5	11380	14300	Inf.	Inf.
10	23760	28600	741	889
15	35640	42400	92.5	86.5
25	59362	71475	4.5	5.5
30	71280	85800	1.8	1.6

If we assume the average load to be one-half the maximum, then at 15 hp from Table 5, we have a pinion life of 92.5 hr and a gear life of 86.5 hr. These values are closer than usual, as this is a cut-and-try proposition. Field testing of sample units and reports from production units have no recorded gear failures.

The finite life of gearing in our opinion is no different from the finite life of any other structural member, so why design gears for infinite life if the other structural members have finite lives due to repeated stressing or corrosion? We try in all cases to design with a finite life equal to or greater than other structural elements of the implement.

Fig. 7 Model WA69 gearset designed for use on a posthole digger

Fig. 8 Gearset model WA66 designed for PTO-driven manure spreader

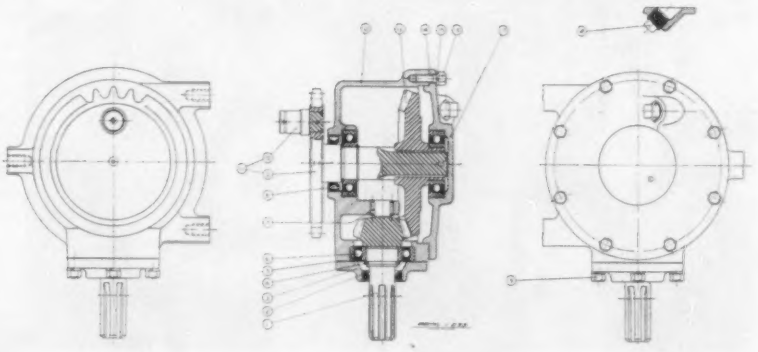

Fig. 9 An assembly drawing of the model WA66 gearbox

Wood Truss Design for Farm Buildings

Merle L. Esmay and James S. Boyd
Member ASAE Member ASAE

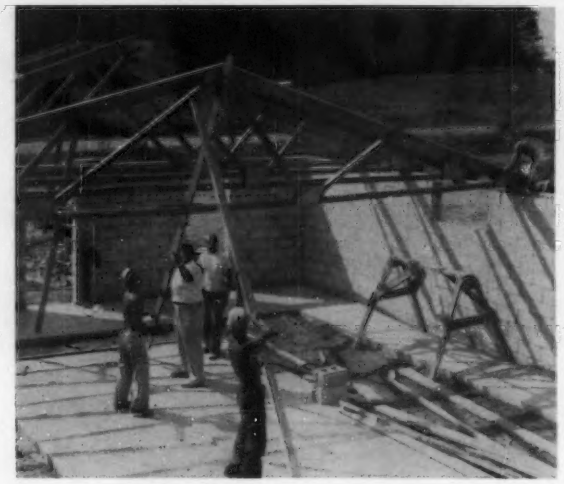

Fig. 1 Erection of 36-ft glue-nail trusses on masonry walls. Trusses are set on walls upside down and pivoted into position

Farmers dislike having to maneuver unwieldly farm equipment around interior posts every time they run their equipment into the shed. Here's how to eliminate such obstructions

WOOD TRUSSES can span farm buildings up to 40 ft wide—yet cost no more than conventional pole or post construction. The light wooden trusses adapt to almost any wall construction. They give a light, economical roof frame easily put up by builders or farmers. Figs. 1 and 2 show typical frame construction with pole or concrete block walls. Single slope trusses for building additions of up to 30 ft are practical.

Paper presented at the Winter Meeting of the American Society of Agricultural Engineers, Chicago, Ill., December, 1957, on a program arranged by the Farm Structures Division and approved for publication as Journal Article No. 2233 of the Michigan Agricultural Experiment Station.

The authors — MERLE L. ESMAY and JAMES S. BOYD — are professors of agricultural engineering, Michigan State University, East Lansing.

Acknowledgment: The authors wish to give credit to the West Coast Lumberman's Association for their cooperation in supporting part of the research at Michigan State University on Farm building truss design, and also to Duane Satterlee and Philip Mielock, graduate assistants, for their work on this project.

Gable Truss Widths

Gable truss widths have been standardized to 24, 30, 36 and 40 ft. Single slope spans are anticipated for 24 and 30 ft. These basic spans will fill most farm building requirements. Lumber yards would stock only these basic sizes.

The trusses have strong joints of either split-ring connectors or glue and plywood gusset plates. The 4-ft spacing for all truss widths gives light, economical, efficient trusses and roof frames. The 4-ft truss spacing allows placing the 2 x 4-in. roof girts flat for easy nailing. Roof

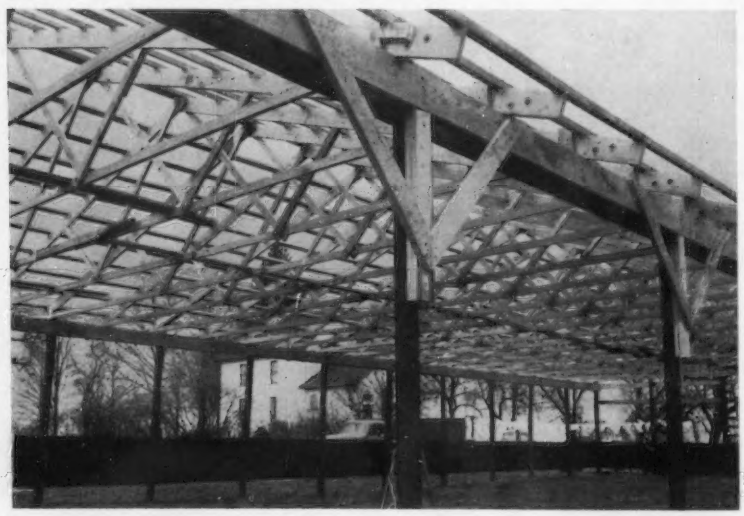

Fig. 2 A 40-ft by 96-ft pole loose-housing dairy barn with ring-bolt trusses spaced 4 ft apart

Fig. 3 Hydraulic truss testing apparatus for measuring the performance of wood trusses under load in a horizontal position

girts are more firmly anchored than is possible in an edge application required for wider-spaced trusses or rafters.

For roofing materials other than sheet metal, a solid 1-in. tongue and groove wood deck may be placed directly over the trusses. One-inch ceiling boards may be applied directly to the lower chords without cross framing or bridging. A single roof slope of 4 in 12 has proved satisfactory.

Performance

Many assumptions must be made in the theoretical analysis of trusses, so performance tests are desirable. Fig. 3 shows a test underway on a truss testing floor at Michigan State University. Hydraulic equipment furnishes measurable uniform loads. The loads are applied on 2-ft centers on the upper chord similar to an actual roof having girts 2 ft apart.

Preliminary tests were made on gable and single slope trusses. The 24-ft gable trusses tested were constructed with 2 x 6-in. upper chords and 2 x 4-in. members for all other parts. Casein glue was used on all glue-nail trusses. The ring-bolt trusses had 2½-in. split-ring connectors at all joints. The heel joints each had two rings and two bolts. Panel points were at the center of the upper chords and third points of the lower chords.

Deflection measurements were made at critical points on the trusses. Fig. 6 shows the load deflection curves for the 24 ft trusses. The deflection measurements plotted on this graph were taken at the ridge. The top solid curves represent the range of a number of tests on glue-nail trusses and the center broken curves the same for ring-bolt trusses. The curves as plotted are, however, the actual tests on specific trusses that were indicative of the range of all tests of similar design. The lower broken curve represents the resulting deflection of a nailed truss as loaded. This nailed truss, assembled for demonstrations, was similar to those occasionally constructed by builders to give a farmer clear-span without properly designed joints. For little additional cost and no extra lumber, good fasteners can be added to the design of such trusses.

The most significant result indicated in Fig. 6 is that the glue-nail truss is about twice as strong as the ring-bolt design. The deflection at failure was, however, less for the glue-nail truss even with twice the load. Note also from Fig. 6 that the load at time of failure was about twice the design load of 30 lb per sq ft for the ring-bolt and four times design load for the glue-nail. The nail truss deflected 3 to 4 in. under a load approaching the 30 lb design load.

In most of the ring-bolt and some of the glue-nail trusses tested, the failure was in the heel joint. Fig. 4 shows a typical failure in which the rings pulled out of the end of the tension member — the lower chord.

The glue-nail truss was found to be a much more nearly balanced design. In some tests the members failed, but usually only when some defect in the lumber was apparent. Fig. 5 shows the results of one heel joint failure on which ½-in. plywood was used for gusset plates.

Single-Slope Trusses

Tests on 24-ft single slope trusses of the ring-bolt and glue-nail design emphasized the concentration of stresses at the lower center joint. This center joint failed first with

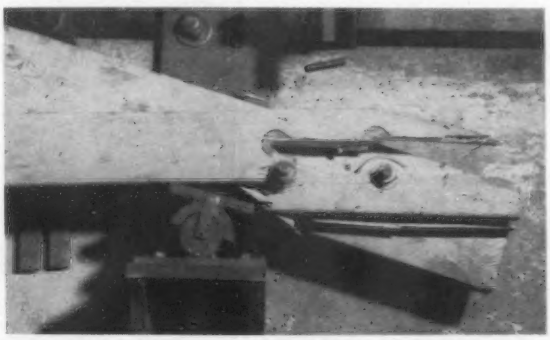

Fig. 4 Test failure of a ring-bolt heel joint of a 24-ft gable truss

Fig. 5 Test failure of a glue-nail heel joint of a 24-ft gable truss

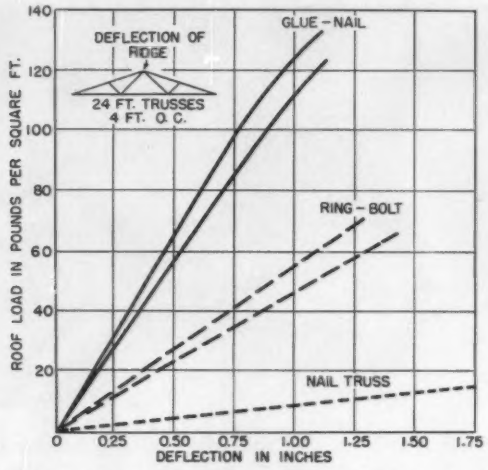

Fig. 6 Ridge deflection and ultimate strength of glue-nail and ring-bolt wood gable trusses

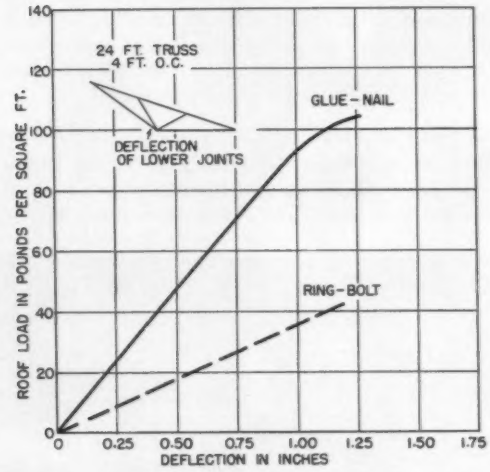

Fig. 7 Deflection of lower joint and ultimate strength of glue-nail and ring-bolt single-slope trusses

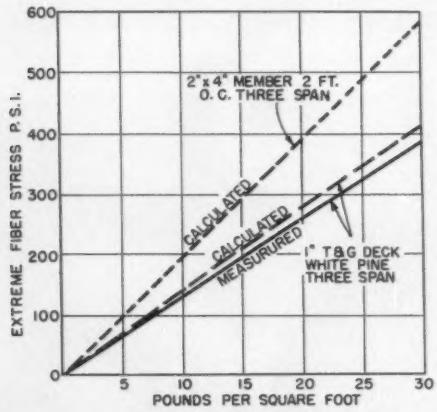

Fig. 8 Measured and calculated bending stresses for uniform loading on a 1-in. tongue and groove roof deck and a 2 x 4-in. girt type roof deck

. . . Wood Truss Design

both types of truss design. As with the gable trusses, the glue-nail showed considerably more strength than the ring-bolt. Fig. 7 shows the comparative ultimate strengths and deflection. The ring-bolt truss failed at about one and one-half times the design load of 30 lb per sq ft. The glue-nail truss failed at over three times design load. This indicates a performance safety factor of 1½ for the ring-bolt design, based upon the 30 lb roof load. This is no doubt a low safety factor. However, the safety factor of 3 for the glue-nail is ample considering the rare probability of an actual 30-lb roof load. For wider single-slope trusses, the design will have to vary from the simple 24-ft trusses.

Roof Deck Design

For sheet metal roofs, the 2 x 4-in. roof girt system is adequate with 4-ft truss spacings. The use of 1-in. solid sheathing on rafters or trusses 4 ft apart has, however, been questioned. A solid deck is required for most roofing materials other than sheet metal.

Michigan State University tested a roof section 12-ft by 12-ft with the rafters 4 ft apart and supported in a horizontal position. The deck was 1 x 6-in. common white pine tongue and grooved boards. The modulus of elasticity of this decking material was found by separate measurement to be 1,195,000. Electric strain gages and Ames dial indicators were used for measurement. Sand was used to simulate uniform loading. Concrete blocks simulated concentrated loads.

Fig. 8 shows the resulting stresses for a 30-lb-per-sq-ft live roof load. A measured maximum stress of slightly less than 400 psi was observed for the 30-lb loading. The calculated stress for an equivalent 1 x 24-in. board is slightly more than 400 psi. The calculated stress for a 2 x 4-in. girt supporting an equivalent load for a spacing 2 ft on center is about 575 psi.

It was assumed from the outset that center-matched lumber would be needed for decking supported only on 4-ft centers. Tests were run, however, to prove this. Fig. 9 shows the measured stresses resulting from concentrated

(Continued on page 409)

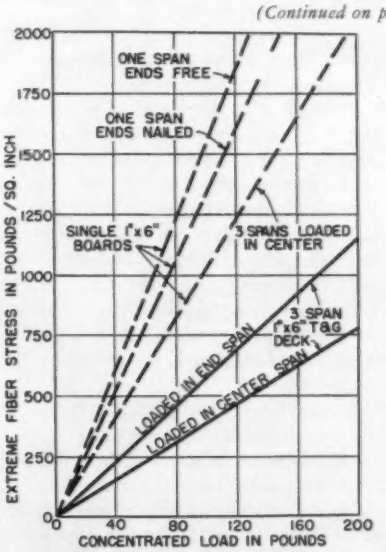
ONE SPAN ENDS FREE
ONE SPAN ENDS NAILED
SINGLE 1"x6" BOARDS
3 SPANS LOADED IN CENTER
3 SPAN 1"x6" T&G DECK
LOADED IN END SPAN
LOADED IN CENTER SPAN
EXTREME FIBER STRESS IN POUNDS / SQ. INCH
CONCENTRATED LOAD IN POUNDS

Fig. 9 Measured bending stresses of white pine 1-in. board as subjected to concentrated loads

Measuring Watershed Runoff in Ontario

To help solve Canadian surface water control problems, the authors measure relationship of snow melt and solar radiation

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Assoc. Member ASAE

H. D. Ayers
Member ASAE

HYDROLOGIC data necessary for the proper design of surface water control facilities in Canada are scarce. While the Canadian government has carried out stream gauging on large watersheds and the Meteorological Division of the Canadian Department of Transport has collected much meteorological data, these sources do not provide adequate information to solve surface water control problems on agricultural land.

Most of the research into the hydrologic phenomena observed under winter conditions has been done in the alpine areas of Europe and North America. Probably data from these investigations would not apply to Ontario, with its low altitude and shallow snow pack.

Thermodynamics of Snow Melt

Wilson(8)* has outlined the thermodynamics of snow melt. This data is fundamental to any study of runoff from snow melt. He shows that warm rain, radiation, convection, conduction from soil and air and condensation are the main heat sources for snow melt. Heat transfer to air, conduction to soil, outgoing radiation, and heat required for evaporation are the possible heat losses. He estimates that the albedo of a snow surface is 66 percent.

Gartska(2), working in Michigan under conditions similar to those in Ontario, found that from two to thirteen times the heat required for snow melt was available from solar and sky radiation alone.

Geiger(3) states that investigators in Europe found that the albedo of new snow was 75 to 78 percent. For old wet snow a value of 43 percent was obtained.

Gerdel(4), working in the western United States, found that albedo varies from 80.9 percent for new snow to 64.1 percent for old snow. He also states that increasing amounts of radiation are absorbed as snow starts to melt. In addition, ice and slush reduce by 50 percent the transmission of radiation in snow.

Preliminary report presented at the annual meeting of the American Society of Agricultural Engineers at the University of Illinois, Urbana, Ill., June 1955, on a program arranged by the Soil and Water Division.

The authors—D. F. WITHERSPOON and H. D. AYERS—are respectively, assistant professor and professor, department of engineering science, Ontario Agricultural College, Guelph, Ontario.

*Numbers in parentheses refer to the appended references.

Absorption Law of Radiation

Hand and Lundquist(5) and Geiger(3) point out that the absorption of radiation by snow follows the absorption law:

$$I = I_o e^{-kd}$$

where I is the intensity of radiation at depth d, I_o is the intensity of radiation transmitted through the surface, and k the absorption coefficient. Gerdel(4) also has observed small amounts of radiation penetration to depths of 38 cm, or approximately 15 in.

Topography of Test Area

Research to gather necessary data began in 1952 at the Ontario Agricultural College. Runoff is gauged and related hydrologic measurements made from four agricultural watersheds each approximately 20 acres in size.

The test area is at latitude 80 deg, 15 min, longitude 43 deg, 32 min. It is in the general physiographic region classified by Chapman and Putnam(1) as the Guelph Drumlin Field. This type of topography is representative of about 1100 square miles of Ontario. The land consists of drumlins or groups of drumlins fringed by gravel terraces.

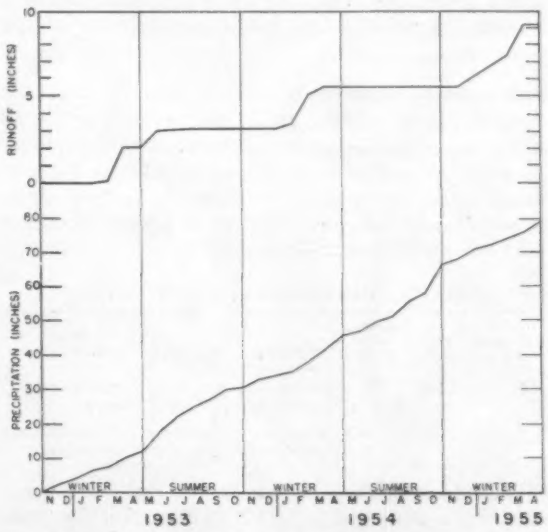

Fig. 1 Mass curves of runoff and precipitation on Watershed W-1

Fig. 2 Type H rate measuring flume and watershed W-1

They are separated by swampy valleys in which flow the tributaries of the Grand River. The elevation is from 1000 to 1400 ft above sea level. The glacial till is stony with some surface boulders. Two main soil types dominate the area — the Guelph and Burford loams. Both are well drained with profiles at least 2 ft deep. They have the characteristics of the Gray-Brown Podzolic Great Soil Group.

Climate of Test Area

The climate is humid-continental, characterized by moderate winters, warm summers, and sufficient rainfall to grow most crops. The mean annual temperature is between 41 F and 44 F. Mean annual minimum is between −10 F and −20 F. Mean annual maximum is between 90 F and 95 F.

Mean annual precipitation varies from 30 to 35 in. distributed evenly throughout the year. Of this, 5 to 10 in. of water equivalent is from 50 to 100 in. of snow, while 25 in. is from rain. Mean winter season rainfall is 2.5 in. Thunderstorms are of high intensity but short duration. According to Thomas(7), maximum 24 hr rainfall in the area is slightly over 5 in. based on a 30-year record. Once in 10 years a 15-min rainfall averages 1 in. The frost free period is between 130 and 140 days, with a growing season of 190 to 200 days.

Experimental Watersheds

In this article only two (W-1, W-3) of the four experimental watersheds within a 5-mile radius of Guelph are discussed. Watershed characteristics are given in Table 1. Runoff measuring structures are complete on these watersheds. Records have been kept for W-1 since November 1952 and for W-3 since January 1954.

TABLE 1. WATERSHED CHARACTERISTICS

Watershed no.	Area, acres	Average slope, percent	Soil types	Treatment	Cover, Winter 1954-55
W-1	15.42	5	Guelph loam Burford loam	cultivated C-G-H-H	Second year hay
W-3	20.81	4	Waterloo sandy loam	cultivated C-G-H-H	12.36 cultivated 8.45 pasture

Runoff measurements are made by 3-ft type-H rate-measuring flumes developed by the United States Soil Conservation Service(6) and the National Bureau of Standards. These are installed on concrete approach structures and are equipped with automatic water stage recorders. The flumes are heated when runoff occurs at below freezing temperatures. For precipitation measurements, United States Weather Bureau Recording and Standard rain gauges are installed on each watershed.

Solar Radiation Recorded

Solar radiation is recorded by an Eppley 10-junction thermoelectric pyrheliometer. A recording potentiometer with integrator is used for recording purposes.

Soil temperatures are recorded in an area adjacent to Watershed W-1. The records are obtained by recording thermometers at 4 and 12 in. under sod cover.

Fig. 1 shows the mass curves of precipitation and runoff for W-1 from November 1952 to April 1955. This watershed was in sod cover from the summer of 1953 to 1956. As shown in Fig. 1, most of the runoff has occurred during the winter months. The only exception is in May 1953. This was a period of heavy thunderstorms, resulting in a high monthly rainfall for May.

Snow stored on the ground melted with the addition of heat from warm air masses, solar radiation, and warm rainfall, causing the runoff shown in Fig. 2 during the winter months.

Fig. 3 shows the characteristic runoff hydrographs on Watersheds W-1 and W-3 resulting from snow melt. The hydrographs of runoff are characterized by gradually ascending limbs to relatively low peak rates between 13:00 and 16:00 hours. The hydrograph from each watershed roughly takes the shape of the solar radiation histogram. In the late afternoon, when solar radiation intensities decrease and air temperatures drop below freezing, the hydrographs show a characteristic long descending limb as the water from snow melt on the watershed is gradually frozen.

Fig. 3 also shows that the air temperature was only slightly above freezing during the runoff period. The relative humidity averaged 70 percent and wind velocities were less than 5 mph during the runoff. Soil temperatures at the 4-in. depth show that no significant heat could have been derived from this source. A snow survey performed prior to the runoff period in Fig. 3 showed an average depth of 4½ in. of snow — equivalent to 1¼ in. of water on the watersheds.

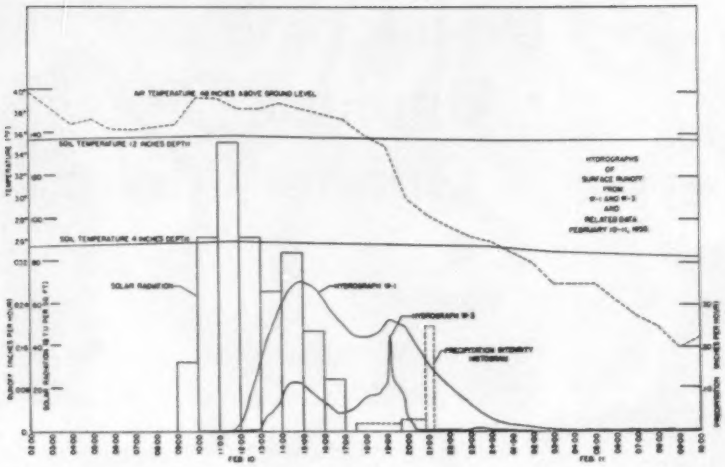

Fig. 3 Relationship between hydrograph shape and solar radiation intensity for watersheds W-1 and W-3

Estimating Amount of Solar Radiation

Assuming the absorption law holds true for snow using the value for K of 0.280 stated by Gerdel(4) for snow of 26.1 percent density, we find that 30 percent of the total radiation penetrated the snow surface, reaching a depth of 4 in. Further, the total solar radiation during the period of runoff was 709 Btu. per sq ft. The total runoff during the hours of solar radiation was 0.2302 in. The heat required to melt this equivalent of snow (assuming the heat of fusion of snow to be equal to that of ice) is 172.6 Btu, or approximately one-quarter of the heat due to incident radiation.

Obtaining Average Albedo

If we assume that no other heat was available for snow melt and that all of the radiation entering the snow was manifest as heat, we would then obtain an average albedo for this snow surface of 75.6 percent, a figure within the range stated by other investigators(2)(3)(4). From these observations it is apparent that the majority of the snow melt contributing to the hydrographs shown in Fig. 3 could be attributed to solar radiation.

Another interesting feature shown by the hydrographs in Fig. 3 is the difference in peak flow rates from the watersheds. As can be seen from Table 1, W-1 was entirely in sod cover. W-3 had 8.43 acres in sod and the remaining 12.36 acres bare soil (sod plowed in fall of 1954) adjacent to the measuring section. Plowing provided a very irregular surface condition. The increased depression storage on this type of surface could have accounted for the lower peak rate from W-3. Increased soil surface melting by solar radiation at the dark soil surface probably increased water movement into the soil. This also lowered the peak flow rate. Further investigation is required to verify these observations.

Although the area under study receives a mean annual snowfall of 50 to 100 in., the measured snow on the ground seldom exceeds 12 in. Frequent periods of high intensity solar radiation cause evaporation from the snow surface and "ripening" of the shallow snow pack even at temperatures below freezing. In addition to snow-melt by solar radiation, warm air and rainfall deplete snow accumulations. There is a lack of data on these phenomena as they occur in eastern regions of this continent, where shallow snow packs are common.

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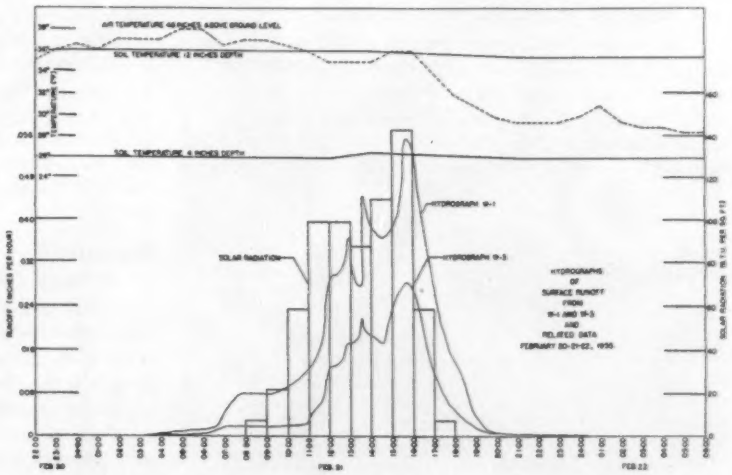


Fig. 4 Relationship between hydrograph shape, solar radiation, and precipitation for watersheds W-1 and W-3

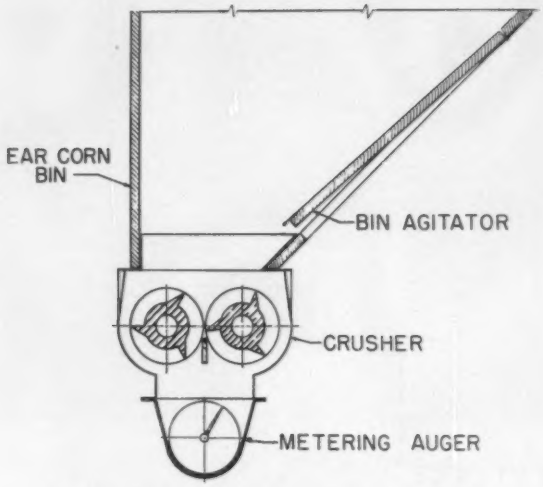


Fig. 1 Schematic section of corn handling assembly

Developing an Automatic Feed Grinder-Mixer

Ralph P. Prince

Assoc. Member ASAE

Select an ear corn metering device and integrate it with suitable grain metering equipment for continuous-flow feed processing

A NEW feed processing research project started at Pennsylvania State University in 1953 sought to: *(a)* investigate various ear corn metering devices for uniform flow characteristics and *(b)* integrate the most desirable device with suitable grain metering equipment in a continuous-flow feed processing unit. The proposed unit was to be completely automatic.

Metering Crushed Corn

While shelled corn and grains can be metered successfully to small hammer mills by several methods, the metering of ear corn presents several problems. Such obstacles as bridging of corn in the bin, controlling shelled corn, and handling corn husks must be overcome before corn can be metered satisfactorily.

Research at Kansas(1)* and at Pennsylvania State(2) shows that precrushed corn produces a smoother motor load than does ear corn when fed to a hammer mill at the same rate. The capacity of the hammer mill is also increased when fed with precrushed corn. A roller crusher was selected for our project because of its relatively low power requirement and uniformity of crushed corn produced.

The crusher, which was operated at 100 rpm, was used only as a granulating device. The crushed corn was removed from the crusher with a 4-in. screw conveyor or metering auger(Fig. 1). The auger is about 14 in. long and is mounted in a trough beneath the crusher. Tests show that the auger's output goes up to about 1800 lb per hr at 45 rpm.

Paper presented at the winter meeting of the American Society of Agricultural Engineers, Chicago, Ill., December, 1956, on a program arranged by the Electric Power and Processing Division and authorized for publication as Journal paper number 2132 of the Pennsylvania Agricultural Experiment Station.

The author—RALPH P. PRINCE—is assistant professor of agricultural engineering, The University of Connecticut.

Acknowledgment: The author is grateful to the electric power suppliers in Pennsylvania for their financial support in this project; also to the Fairbanks, Morse Co. for the hammer mill and to the Duplex Mill and Mfg. Co. for the corn crusher used in this unit.

*Numbers in parentheses refer to the appended references.

Another method of removing crushed corn from the crusher was tested, but proved unsatisfactory. It used a flighted chain drag conveyor as the metering device. The first conveyor tested was mounted in a trough beneath the crusher with the flights in the vertical position. The flight spacing was 18 in. The second drag-type conveyor tested had a flight spacing of 9 in. and was mounted with the flights in the horizontal position. The performance of the second conveyor was superior to the first — the decreased flight spacing evened out the flow of crushed corn. However, the flow was still somewhat irregular, particularly at the lower removal rates of 300 to 800 lb per hr.

Ear Corn Bin

The size and shape of the ear corn bin were governed to some extent by the corn crusher. The bottom bin opening had to fit the crusher throat — about 9 in. by 9 in. No restrictions were placed on the top opening or on the general bin shape, as long as the bin's primary function of preventing bridging was maintained.

The first bin was made from boiler plate bent in the shape of a half cone and connected to two adjacent vertical plywood sides. In an effort to prevent bridging an electric vibrator was attached to the metal plate about one-third of the way up from the bin bottom. Rather than freeing the corn, however, the vibrations caused excessive wedging of the ears at the bin mouth.

It was decided to connect the two adjacent vertical plywood sides with two plywood sides that sloped at a 45-deg angle (Fig. 2). This bin is 3½ ft square at the top by 2½ ft high. It holds about 350 lb of ear corn. While this bin design helped prevent bridging, some external agitation was still necessary to eliminate bridging in the bottom of the bin.

Bin Agitator

Presently a mechanically agitated plate cut out of the bottom of one of the sloping bin sides is being used (Fig. 3). Best results were obtained with a plate 12 in. wide at the top, 6 in. wide at the bottom, and 18 in. long. This plate is hinged at the top. It is oscillated at the rate of 20 cycles per minute by a cam and a spring-loaded cam follower. With the cam follower in the center of the plate and given a throw of ½ in., the plate can move about 1 in. at the crusher.

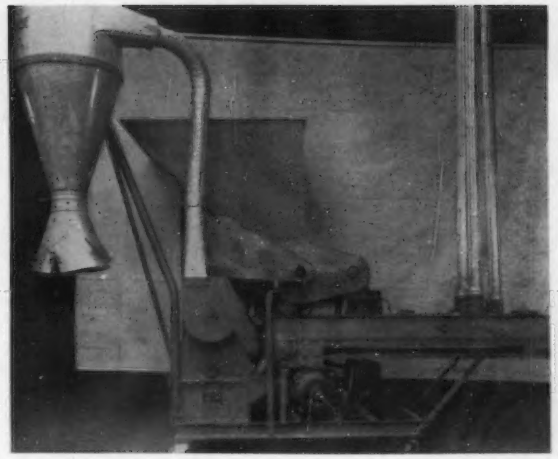
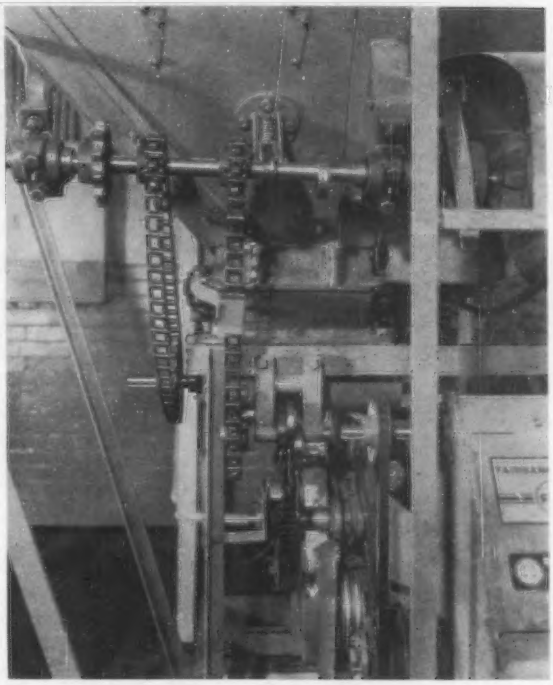


Fig. 2 Experimental unit

Fig. 3 Front view of unit with shields removed to show method of corn bin agitation and positive drive features



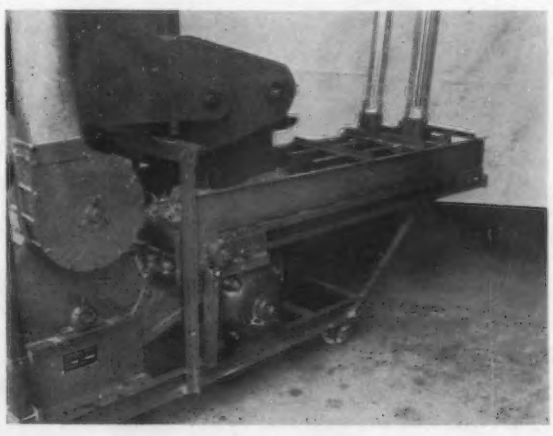
A compression spring on the cam follower prevents breaking the plate (Fig. 3). This spring is essential when the plate can not move due to the alignment of ears in the bin. The spring can be preloaded up to 220 lb by inserting flat washers between the spring and the mounting bracket. However, results show that bridging can be prevented with a 120 lb preload on the spring.

Other agitating devices examined and abandoned included a single-stoker auger revolving slowly in the vertical corner of the bin. This proved to be insufficient agitation. A second auger was installed in the opposite and sloping corner to revolve slowly outward. This auger did prevent bridging, but was considered to be too expensive and too cumbersome to install.

Metering Grains and Concentrates

Several methods are available for metering grains and concentrates to a hammer mill. The flat conveyor method was chosen because of its relatively low cost, simplicity of design, and low power requirements. A flat rubber belt conveyor 14 in. wide by 5 ft long, served as the blending table (Fig. 4). The table is divided into three compartments above the belt to provide space for six metering pipes. Each side of this table is a separate unit and consists of two angle iron rails, a bearing mounting bracket, a belt tightening screw and a 5-in. deep side piece. When the inside legs of the angles are bolted to a sheet metal bottom, a guide for the 3-ply by 3/16-in. smooth surface belt is formed. This sheet metal bottom not only ties the sides together but also prevents the belt from sagging between the pulleys.

Fig. 4 The smooth-surface flat rubber conveyor functions as the blending table to transport all ingredients of the ration to the hammer mill at a uniform rate

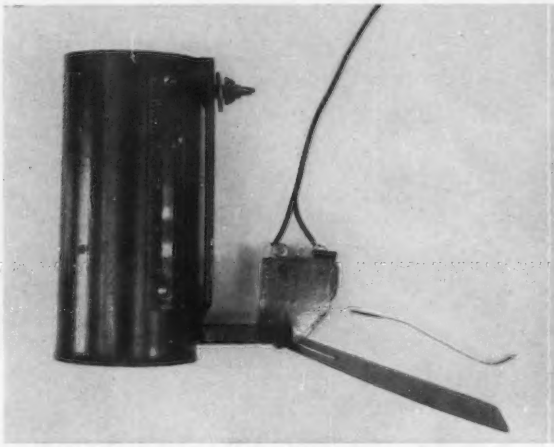


Metering Pipes and Microswitches

The metering pipes (Fig. 5), are about 4¼ in. in diameter by 7 in. long. Welded to each pipe is a ⅜-in. by 6-in. carriage bolt track and a microswitch mounting bracket.

The pipes can be set at any point from the belt to about 4½ in. above the belt. The carriage bolt is held by an angle iron cross member on top of the blending table.

Two methods of setting the pipes were used. One was to index a graduated scale on the pipes to a fixed pointer on the angle iron cross member. The other method had stepped gauge blocks (Fig. 6), inserted between the belt and the pipes. Three blocks, one with 1-in. steps, one with ½-in. steps, and one with ¼ by ⅛-in. steps, enabled the pipes to



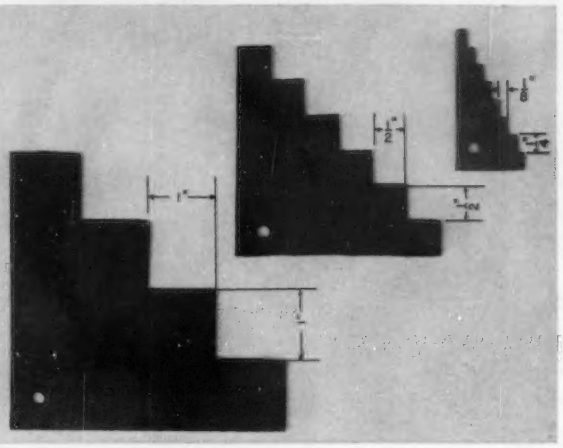


Fig. 5 A metering pipe showing the microswitch and floating arm mounting • Fig. 6 Stepped gage blocks used to set the metering pipes

. . . Automatic Grinder-Mixer

be set at ⅛-in. intervals. Either method of setting the pipes seems to be satisfactory.

When any ingredient fails to flow, the unit is stopped by microswitches mounted on the metering pipes. The switches are actuated by the force exerted from floating arms that ride on top of the channel of grain. The absence of any ingredient is immediately detected by the switch, which stops the unit. Since the switches and floating arms are mounted on the metering pipes, no adjustments are necessary when making the necessary pipe-height setting.

Mechanical Control

The decision to drive the blending table, the corn assembly, and the hammer mill by a single 5-hp electric motor governed the drives to use. This problem was greatly simplified by selecting a hammer mill that is self-cleaning and will not plug when started under overloaded conditions(3). With these hammer mill characteristics, it is not necessary to have an electric clutch in the hammer mill feeding drives for starting and stopping the unit. All unit parts, therefore, can be positively driven from one motor through suitable belts, chains and speed reducers (Fig. 7).

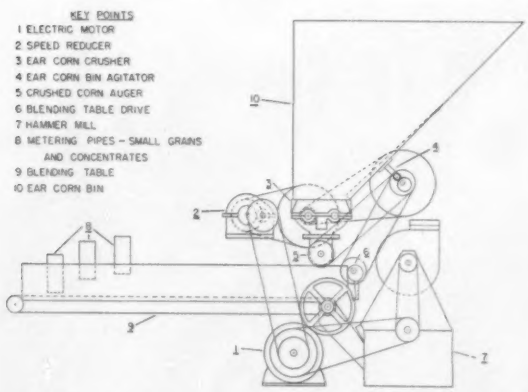


Fig. 7 Schematic diagram of complete unit showing power train

Speed Adjustment

The crushed corn metering auger and the blending table are driven by the agitator shaft. Six different steel chain sprockets that can be interchanged on the shafts provide the necessary auger and table speed adjustments. These adjustments are essential because the hammer mill capacity varies with the size of the screen and the kind and condition of ingredients to be ground.

The unit can be set to process practically any ration. A table speed of about 1½ fpm was found to be satisfactory for rations containing ear corn. Table speed may be increased when grinding a swine or poultry ration for maximum efficiency.

In setting the unit to process a dairy or beef ration, a hammer mill capacity is first predicted. This is based on screen size and kind and condition of the ingredient to be ground. From this assumed hammer mill capacity, the appropriate sprockets are put on the auger and agitator shaft to produce a flow of crushed corn in proportion to the ration. The metering pipes are then adjusted to proportion grains and concentrates to crushed corn. Readjustments must be made if the proper sprockets have not been chosen. Once the various adjustments have been made for a given ration, it requires only a few minutes to reset the unit.

Once the unit has been adjusted for a particular ration, auger and table speed can only vary in direct proportion to the motor speed. A proportionate amount of each ingredient, therefore, is delivered to the hammer mill during any period of time.

Electric Controls and Protective Devices

Microswitches on metering pipes and on crushed corn metering auger are wired in series with the motor starter control (Fig. 8), to prevent the unit from processing only a part of the ration. The absence of any ingredient is immediately detected by a switch to stop the unit. Provision is also made to stop the unit at the end of the present grinding time by an electric timer. An ammeter in the motor circuit indicates when the unit is operating at rated load.

Four permanent horseshoe magnets remove tramp iron from the ration. They are equally spaced on a bracket across the width of the blending table. The bracket and magnets

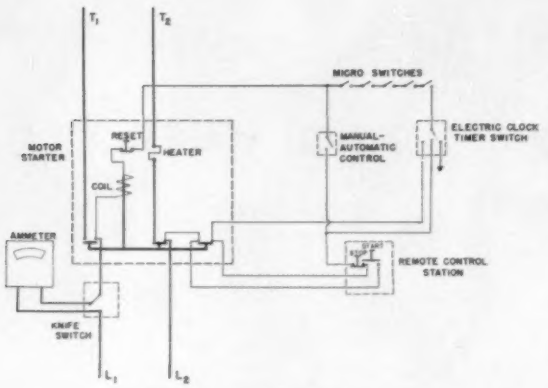


Fig. 8 Wiring diagram used for this unit

are located in the hammer mill chute so that all ingredients of the ration flow over them.

Metering Auger Tests

As an experiment, the crushed corn metering auger was calibrated for two cribs of corn. Corn in crib A was free of husks but about one-third of all ears had been shelled. Corn in crib B had every little shelled corn present but about three-fourths of the ears had some husks on them. The corn was dry in both cribs.

The auger output, in pounds per hour, was examined at seven different auger speeds ranging from 9 to 27 rpm. Tests were made at random and repeated to offset possible error from varying depths of corn in the bin.

The results of these tests indicate that a speed output curve combining the results of both cribs can be drawn without serious error (Fig. 9). The greatest variation in auger output between the two cribs was 9 percent which occurred at an auger speed of 16 rpm.

Field Tests

The unit was tested on a 42-cow dairy farm in Central Pennsylvania from October 1, 1956 to December 1, 1956. During this period, 350 lb of feed was ground and fed each day. The ration consisted of ear corn, oats, barley and a concentrate.

The capacity of the unit was about 800 lb per hour when grinding through a ⅜-in. mesh screen. The unit was operated approximately 30 min each day to supply the required ration. The fineness modulus and uniformity index of the ground feed were 2.84, 1:7:2, respectively.

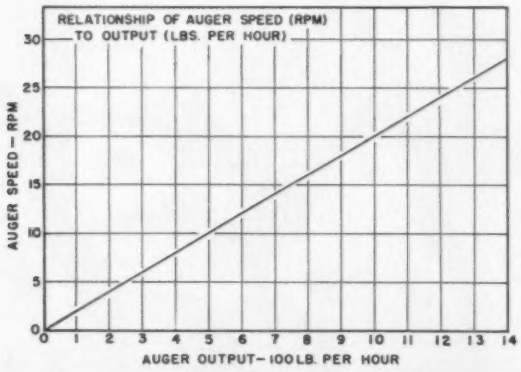


Fig. 9 Summary of speed-capacity tests of the crushed corn metering auger for two dissimilar cribs of corn

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. . . Wood Truss Design

(Continued from page 402)

loads. A concentrated load of 200 lb — a man's weight — caused a stress of only 780 psi in the center span and 1125 psi in the end spans of the solid deck. A single continuous span board was stressed to 2000 psi with the 200-lb load in the center.

To show the advantages of continuous spans and end fixity, other tests were made (Fig. 9). A 150-lb load at the center stressed a single-span single-board to 2000 psi. If the ends were left unnailed to make a simple beam out of the single board, 130 lb stressed it to 2000 psi. A 200-lb concentrated load applied at the center span of a 2-in. by 4-in. member caused a stress of 1175 psi as compared to 780 psi for the solid 1-in. deck.

Conclusions

- Trusses designed for 4-ft spacing provide a light economical roof frame which is easily fabricated and erected by builders or farmers.
- Standardizations of four spans (24, 30, 36 and 40 ft) with one roof slope of 4 in 12 meets the requirements of practically all one-story farm buildings.
- Single slope trusses of 24-ft are possible and practical for clear-span additions to barns.
- Glue-nail 24-ft gable roof trusses tested withstood twice the load that ring-bolt trusses did, and deflected less than one-half as much under equivalent loads.
- Glue-nail trusses tested had an ultimate strength of approximately four times the assumed design load of 30 lb per sq ft and the ring-bolt trusses twice as much.
- Heel joints proved to be the weak points of the ring-bolt gable trusses tested.
- The glue-nail single-slope 24-ft trusses tested had an ultimate strength of over three times the 30-lb design load and the ring-bolt trusses 1½ times as much.
- The lower center joint of the single-slope trusses proved to be the weak point of both the glue-nail and ring-bolt designs.
- A 1-in. tongue and groove deck on rafters 4 ft apart was stressed only about 400 psi with a uniform load of 30 lb per sq ft.
- A tongue and groove deck on rafters 4 ft apart was stressed only slightly more than one-third as much as unmatched roof boards under similar concentrated loads of up to 200 lb.
- A tongue and groove deck on rafters 4 ft apart was stressed only two-thirds as much as a 2 x 4-in. girt type deck under concentrated loads up to 200 lb.

Remote Indicating Thermometer for Animal Research

L. N. Drury
Member ASAE

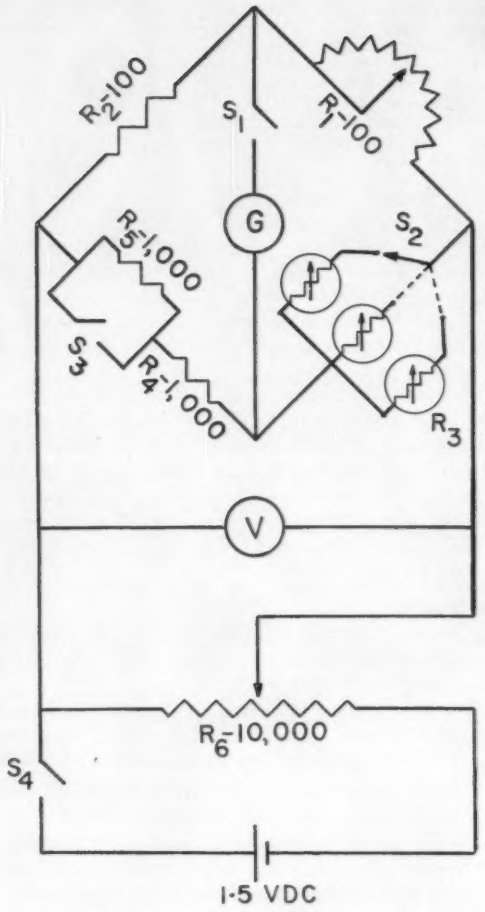

Fig. 1 Schematic diagram of thermometer shows values of circuit parameters for measuring temperatures

Parts Description

R_1 = Precision circular slidewire resistance: 100 ohms, 250 scale divisions (From Leeds and Northrup 318262 potentiometer).

R_2, R_4, R_5 = Precision (1 percent) wire wound resistors, ½ watt.

R_6 = Voltage divider potentiometer, General Radio Co. Type 471-A, 10,000 ohms.

R_3 = Thermistor probes, Victory Engineering Co. Catalog No. 32A1, 2000 ohms (±20 percent at 77 F, 3.9 percent change in resistance per degree Centigrade at 77 F, glass-encased, 0.1-in. diam, 2 in. long.

G = Galvanometer, Leeds and Northrup Catalog No. P.1. 24 D, sensitivity 0.5 microamps per scale division, coil resistance 1,000 ohms.

V = Voltmeter, Weston, 0-1 volt d-c, 125 ohms.

1.5 VDC = No. 6 dry cell.

S_1 = Galvanometer switch, SPST momentary contact.

S_2 = Rotary switch, 19 positions plus Off, for selecting individual thermistors.

S_3 = SPST switch for selecting high or low temperature measuring range.

S_4 = SPST switch to disconnect the dry cell.

AN INSTRUMENT for precise measurement of body temperatures of chickens was needed in research at the University of Georgia. Specifications considered desirable were: multipoint remote indication; accuracy, ±0.2 F; sensitivity, 0.1 F; response time, less than 30 seconds for an 80 F change in temperature; and sensing elements that could remain in the bodies of living chickens for several days. Cost of the instrument and accessories was not to exceed $100.

Commercial instruments that meet or exceed these requirements are available within a higher price range. Actually, the cash outlay for the instrument designed and built by the author was approximately $60, including accessories for measuring temperatures at 19 points†. Not included in this cost were a galvanometer and precision slidewire resistance obtained from a surplus indicating potentiometer. If purchased new, these components (or others sufficiently precise) would add about $50 to the cost of the instrument.

A null-balance D.C. Wheatstone bridge circuit is used, with thermistor sensing elements. Thermistors are thermally sensitive resistors having a high negative temperature coefficient of resistance (in the order of 2 to 3 percent resistance change per degree F at 77 F). Thermistors are available in a variety of sizes and shapes. For use in chickens and other small animals a small, glass-encased insertion probe thermistor was selected because of its shape, smoothness, rapid response to changes in temperature, and stability of resistance for a given temperature. These thermistors are similar to that shown by Taylor (2).*

The completed instrument has been calibrated and used for measuring rectal temperatures of more than 400 chickens to date, including adult hens and 6-week old broilers. With two operators (one to insert and hold the probe and the other to manipulate the instrument), rectal temperature measurements on 125 hens in laying cages were made at the rate of one per minute. If a separate probe is left inserted in each animal (as in a small climatic chamber), only one operator is needed and temperature readings at the

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The author — L. N. DRURY — is agricultural engineer, Agricultural Research Service, U.S. Department of Agriculture, and research associate in agricultural engineering, University of Georgia, Athens.

*Numbers in parentheses refer to the appended references.

†The number of possible points is limited only by the capacity of the selector switch and thermistor plug-in panel.

Acknowledgment: The author appreciates the technical advice and helpful suggestions of B. C. Haynes, Jr. and A. T. Hendrix, agricultural engineers, ARS, USDA, Athens, Ga.

rate of ten per minute should be possible. A measuring range of 80 to 300 F should be possible with this instrument; but no attempt was made to calibrate it beyond the 104 to 115 F range of body temperatures expected in adult chickens exposed to weather extremes (1). Values of circuit parameters which have proven suitable for measuring temperatures within this range are given in the schematic diagram of the thermometer, Fig. 1, and in the accompanying parts description.

For accurate temperature measurement, each probe must be calibrated in the circuit. This was accomplished by immersing the probes in a precision water bath held within 0.09 F of the desired temperature and adjusted in steps of approximately 0.72 F from 104 to 115 F. Each probe was selected in turn at each bath temperature and the corresponding instrument scale indication recorded. A calibration curve of degree temperature versus scale indication was then plotted for each probe. Recalibration six months later revealed no drift in scale indication for any of the probes.

One division of the instrument scale equals approximately 0.25 F‡. One-fourth scale division may be estimated, giving a readability of 0.06 F. For both calibration and use, the probes were immersed (or inserted) to the same depth (approximately 4 cm).

In use, the probe is plugged into the instrument, inserted into the animal for at least 10 seconds and held while adjusting the slidewire for zero galvanometer deflection. (Galvanometer switch, S_1, must be closed during slidewire adjustment.) Because of the probe's quick response, longer immersion time is not necessary for accurate temperature measurement. The instrument scale reading is converted to temperature degrees by referring to the calibration curve for the corresponding thermistor.

To minimize electrical heating of the thermistor (which would result in a false temperature indication), the power dissipated in it should not exceed 20 microwatts in air or about 100 microwatts in water§. In the circuit shown, the thermistor power dissipation is less than 20 microwatts when the bridge potential is less than 0.28 volt. Since galvanometer response is lessened if the bridge potential is greatly reduced, a value of approximately 0.25 volt is used. Closing the temperature range switch (for high range) shorts one of the 1,000-ohm resistors, giving more scale divisions per degree temperature change. For the null-balance condition, $R_1/R_2=R_3/(R_4+R_5)$. As the ratio $R_3/(R_4+R_5)$ approaches unity, a given percentage change in R_3 necessitates a larger change in R_1, even though the percentage change in R_1 is the same. The amount of change in R_1, rather than percentage change, is indicated on the instrument scale. High range is suitable for measuring temperatures above 104.5 F with the thermistors used.

As compared to a deflection instrument, more time and effort is required to obtain a temperature reading with this null-balance arrangement. On the other hand, scale reading errors are minimized because the scale position may be noted at any time after balancing and prior to readjusting the slidewire for the next reading. The glass thermistor probes are easily broken by rough handling; but replacements cost only about $2.00 each and more rugged probes are available (at higher costs) for rough use. The temperature measuring range can be extended downward to 0 F or lower by connecting higher resistances in series with R_4.

The thermometer built by the author exceeds most of the requirements for precise body temperature measurement in animals. It can be built for less than one-half the cost of commercially available instruments having similar sensitivity, speed, and accuracy. It is simple, rugged, stable, and is designed to reduce errors in scale reading.

‡The number of scale divisions per degree decreases as the temperature increases. Greater sensitivity may be obtained by using *(a)* a more sensitive galvanometer, *(b)* a slidewire having more turns and a longer scale, and *(c)* providing more range change resistors having smaller increments of resistance.

§Permissible power dissipation also varies with the size and configuration of the thermistor and its encasing material.

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. . . Measuring Runoff

(Continued from page 405)

Two-Year Results

Fig. 4 gives the characteristic hydrographs of snow melt from W-1 and W-3, with the effect of rain turning to snow shown. The hydrograph of discharge from W-3 again has a lower peak rate. This may be caused by surface storage on the plowed soil surface. However, a much greater increase in peak flow rate from W-3 relative to W-1 is apparent with rainfall under these cover conditions. Flow from W-1 shows less tendency toward a sharp peak from rainfall. Again the hydrographs exhibit the long ascending and descending limbs characteristic of winter conditions.

The two-year results presented are useful for comparison only. The exposure and orientation of the two watersheds W-1 and W-3 are similar. Differences in area of watershed are not considered significant when runoff rates are reduced to inches per hour.

Two years' data indicate that a large portion of the runoff occurs during the winter months of February and March. Peak rates are relatively low. The simultaneous occurrence of peak runoff rate and high intensity solar radiation indicates that runoff from snow melt depends largely upon solar radiation as a heat source.

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1961 — L. T. Wendling, D. R. Burrowbridge, D. G. Jedele

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Committee on Standards for Measuring Intake Rates of Soil for Irrigation System Design (1958-60) — W. W. Donnan

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. . . The Second 50 Years

(Continued from page 395)

neering and agriculture. The recent elevation of agricultural engineering to division status by the Agricultural Research Service of the U.S. Department of Agriculture is an indication of the increasing importance of the role of agricultural engineers in the field of research. Also, in the public service field there is a strong demand for the services of agricultural engineers in the technical aid programs to foreign countries.

Professional Development

Our principal opportunity for professional development, of course, exists in the framework of our Society. Forty-seven committees are now active in the five professional divisions under the supervision of the division steering committees. These committees are engaged in important activities such as: *(a)* the development of industry-wide engineering standards for products and practices, *(b)* the compiling of handbook or reference data on specific subjects, *(c)* the preparation of Society recommendations on engineering practices, *(d)* standardization of terminology in new fields, and *(e)* the preparation of bibliographies and other information.

Another 36 special committees or representatives are making steady progress in achieving recognition for the profession. For example, one ASAE committee was largely responsible for achieving recognition by the Department of the Army of agricultural engineering as a specific profession. Intra-society professional progress is the goal of nine standing Society committees.

Our professional contacts with other scientific and engineering organizations are increasing. Some of the latest additions coming within the last few months are: *(a)* a joint committee with the American Society of Heating and Air-Conditioning Engineers to develop joint activities on controlled environment for livestock and plants. ASHAE, as you may know, has extensive laboratories for testing the effects of environment; *(b)* a joint committee with the Illuminating Engineering Society to develop standards for farm lighting — long advocated by representatives of our Electric Power and Processing Division; and *(c)* the Society has been included as a joint sponsor of the Nuclear Engineering Congress along with other major engineering societies. These and other similar activities contribute to professional recognition for agricultural engineering: and indirectly, each effort in its small way, benefits every agricultural engineer through increased prestige, recognition, and eventually increased personal opportunity. After all, it's the accumulation of small bricks that make the building; likewise, the accumulation of bits of professional progress will establish our profession. It is every member's responsibility to add his bricks of professional achievement at every opportunity.

Sections Vital to Progress

In addition to the parent society, the members are served in various parts of the country by 29 local, state or regional sections. Four sections were organized in the past year. These sections serve a great need for the 80 percent of our members who are unable to attend the national meetings of the Society. To this 80 percent, their section *is* ASAE! For the section provides the opportunity for the members to meet frequently, to continue their professional development and to enjoy good fellowship. It is also significant that the geographic pattern of growth is closely allied with the sections; those areas being served by sections showing a much faster rate of growth than the areas not so served.

The geographic sections of our Society operate under a liberal set of by-laws for good reason—to encourage the section members to plan as active a program as they wish, tailored to their needs. They function with a maximum of help from the headquarters office and a minimum of restrictions. So it is really up to the members to chart their own course with the ASAE Council's blessing.

In visiting the sections this year I have observed with great satisfaction the important part our younger members are taking in section activities. This is as it should be.

A careful study of the geographic distribution of our members reveals the need for at least 20 more sections if our members are to be adequately served. The value of the sections has been well proved by our own experience and by the success of the other engineering societies. In fact, our future growth — our real strength — is dependent largely on this expansion. Based upon my observations during the past year I submit to you this proposal:

(a) To you older men who may be already burdened with work in the parent society, take only enough time to select a younger man on your staff or of your acquaintance to take the leadership in forming a section to serve your area. Inspire him to contact other younger members in the area and to request the help readily available from the headquarters office. In so doing you will be performing a great service to your Society.

(b) To the younger men I offer this challenge—take advantage of this opportunity for professional development. Remember that this Society was founded 51 years ago by a group of eager young men. You, too, have an opportunity to pioneer!

Motion Picture Progress

We look forward to broadening our contacts with the general public through the medium of the proposed motion picture portraying our profession. After several years of planning the committee in charge has developed a positive plan of action. A competent producer has been selected and the script is now in preparation based upon the committee's suggested method of treatment. Completion of this film will be another benchmark in our professional development. We expect it to be a distinct contribution in line with current national policy to interest high school students in science and engineering. It is designed to help those who have special interests and abilities in the field of science and in agricultural engineering in particular, to plan their academic careers in high school and college accordingly. It will tell the story of the excellent opportunity for farm-reared boys who wish to maintain close relationship to the agricultural field through our profession. And it will broaden our field of service by telling prospective employers of the type of training given in the academic course.

This is our rich heritage—these are the challenges and opportunities for further professional development of which we should be mindful as we chart our course for the second 50 years.

The Job Ahead

Now what are some of the new engineering challenges in the rapidly changing field of agriculture?

Mechanization in the Field

The achievements of agricultural engineers in the fields of power and machinery and soil and water have been dramatically told by many of the past-presidents of this Society. These are the fields in which they are acknowledged authorities. They have told of power and machinery to speed field operations when the crops and weather are right; to cut field losses and improve quality through earlier and faster harvesting; to reduce hand labor and drudgery in planting and harvesting; to apply pesticides to crops and animals. Judging from the research now in progress we shall see great and many advancements in the power and machinery field. It was a thrilling experience for me recently to start and stop a tractor engine by means of a radio control mechanism developed by the agricultural engineers at one of our state agricultural experiment stations, and at the test field of a tractor manufacturer I saw a driverless tractor following an obstacle course automatically guided by an electronic control. Further application of electronics offers exciting possibilities.

The application of engineering principles in the form of better terraces, strip cropping, drainage and gully control has greatly reduced the hazards of excess precipitation. And the development of new equipment and methods for irrigation has helped maintain crop production in times of drought. Recent research leading to the development of more accurate meters for measuring ground moisture for irrigation timing and the use of plastics and chemicals to reduce water evaporation on the land and on the reservoir are examples of benefits farmers will receive in this field. We should be tremendously proud of these achievements in power and machinery and soil and water which have revolutionized farming in the past half century.

Lag in Farmstead Mechanization

Now I would like to discuss some of the agricultural engineering accomplishments and challenges which are concentrated on a few of the non-tillable acres of the farm or ranch—the farmstead. This area has been largely ignored by both farmers and our members in their rush to get to the fields to tend the soil and the crops. A

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C. T. RASMUSSEN

V. H. BAKER

F. B. WRIGHT

C. T. Rasmussen, who was formerly employed as chief engineer of the John Deere Killefer Company in Los Angeles, Calif., has been transferred to the Industrial Product Engineering Department of the John Deere Wagon Works in Moline, Ill. He will be responsible for the supervision of a new section of this department.

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Vernon H. Baker, research professor, agricultural engineering department, Virginia Polytechnic Institute, has announced his appointment as president and director of engineering and public relations for radio stations WESR, Eastern Shore Radio Center, Tasley, Virginia, and WYNN, Florence, South Carolina. He will supervise the construction of WYNN this summer as he did previously with WESR and WBCR. Mrs. Baker is secretary-treasurer of WESR and WYNN.

Dr. Baker received a PhD degree in agricultural engineering from Michigan State University as well as a BS degree in electrical engineering from the University of Tennessee. During World War II he served as electronics officer in the navy. He joined V. P. I. in 1949 where he conducted research with his associates publishing more than 30 papers relative to the electric power and processing field. He will maintain his home in Blacksburg, Virginia.

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Forrest B. Wright of the New York State College of Agriculture at Cornell University will retire from the university faculty June 30 after having directed the education of nearly 10,000 men and women and completing 38 years of service to the university.

Dr. Wright is also well known for his inventions which include an automatic egg-washing machine, a machine for drying washed eggs, and a machine for automatically feeding eggs onto a grader, washer, or drier.

In association most of the time with Prof. B. B. Robb, who started the course, Dr. Wright has taught household mechanics for 30 years, instructing women in the principles and practice of mechanics on cars, sewing machines, refrigerators, electric appliances, and plumbing systems.

Dr. Wright joined the Cornell staff as an instructor in 1921, receiving his BS degree in 1922, his MS in 1924 and his PhD from Cornell in 1933.

He organized and started a course in rural electricity in 1934 and has taught courses in farm machinery, farm power, and water supply and sanitation. His book, "Rural Water Supply and Sanitation," was selected by the New York Public Library as one of the 100 most essential technical books in 1957. He is also the author of "Electricity in the Home and on the Farm." Dr. Wright has authored nine bulletins and many popular articles on a variety of subjects.

He is a charter member of the Ithaca Kiwanis Club and its third president; a member of the Ithaca Rotary Club, serving for four years on its Board of Directors, and a member of the Ithaca Community Chest teams. He has also served on the New York State Housing Committee Advisory Board and the College Housing, Weed Control, and Fire Prevention Committees. Since 1923 he has been prominent in church and Boy Scout work.

Dr. Wright is listed in "Who Knows & What" and in "American Men of Science."

His retirement plans include writing magazine articles and revising his first book, "Electricity in the Home and on the Farm."

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Erwin R. Johnson has accepted the position of assistant chief engineer for Hanson Equipment Co., Beloit, Wis., where he will be in charge of the design and testing of all agricultural products by the company.

Mr. Johnson is a graduate of the University of Minnesota, from where he received his BS degree in agricultural engineering and in 1949 he received an MS degree from Iowa State College. He was employed at Iowa State College for four years prior to his assignment in 1951 as manager of the International Harvester Farm where he remained until accepting his present position.

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Otto F. Theimer, recently located in Germany, is now with the FAO-Mission to Syria as wheat storage expert to enable the Syrian people to obtain proper storage facilities. He reports that a surplus of 200,000 tons of wheat is expected in that country this year.

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L. F. Curtis at present is associated with the Anhydrous Ammonia Commission of Baton Rouge, La. He was formerly in the agricultural engineering department of Louisiana State University.

•

Peter J. Clifford, former design engineer with International Harvester Co., is now project engineer associated with H. D. Hume Co. of Mendota, Ill.

Thomas E. Clague has accepted a position with Aubrey, Finlay, Marley & Hodgson, Inc., as advertising copywriter. Previously he was connected with John Deere Dubuque Tractor Works as experimental engineer.

•

Walter M. Ashley resigned his position of design engineer with International Harvester Co. to accept an engineering position with Babco Builders, Inc., general contractors of Wheaton, Illinois. His new position will include supervising planning, specification writing and sub-division development.

•

Gerald C. Zoerb recently accepted a teaching assignment in the agricultural engineering department, South Dakota State College, Brookings.

•

Paul K. Turnquist, upon completion of active duty in the U.S. Army, has accepted a position as instructor in the department of agricultural engineering at Oklahoma State University.

•

Allen J. Moe, formerly a designer with Minneapolis-Moline Co., is presently working as application engineer with Perfect Circle Corp. of Hagerstown, Indiana.

•

James N. Luthin, formerly connected with the department of irrigation of the University of California, has been transferred to Australia where he is associated with Waite Institute in the division of soils.

•

Herman P. Lynn recently became extension agricultural engineer connected with Clemson College Extension Service. Formerly he was manager of the irrigation department of United Cooperatives.

•

George V. Frushour, until recently employed by the James Mfg. Co., is presently associated with J. I. Case Co. of Bettendorf, Iowa, as design engineer.

•

Jabez J. Bruwer, formerly in the agricultural engineering dept. of the University of Nebraska, has been transferred to the University of Pretoria, S. Africa, where he will serve as instructor.

•

Knud B. Sorensen became assistant chief product engineer, Industrial Tractor Div., John Deere Research and Engineering Center of Deere Manufacturing Co., Waterloo, Iowa. Previously he was chief engineer with the John Deere Wagon Works.

•

William C. Stephens, after serving 10 years with Hamilton Equipment, Inc. of Ephrata, Pa., resigned and has accepted the position of sales manager for National Bearings Co., Lancaster, Pa.

ASAE MEETINGS CALENDAR

August 7-9 — NORTH CAROLINA SECTION, Banner Elk, N. C.

August 25-27—NORTH ATLANTIC SECTION, Guelph, Ontario, Canada.

October 3-4 — TENNESSEE SECTION, Memphis, Tenn.

October 22-25 — PACIFIC NORTHWEST SECTION, Oregon State College, Corvallis, Ore.

October 30-31—SOUTH CAROLINA SECTION, Clemson Agricultural College, Clemson, S. C.

December 17-19 — WINTER MEETING, Palmer House, Chicago, Ill.

April 3-4 — MID-CENTRAL SECTION, Hotel Robidoux, St. Joseph, Mo.

NOTE: Information on the above meetings, including copies of programs, etc., will be sent on request to ASAE, St. Joseph, Mich.

This box silo built of pressure-creosoted poles and lumber stands in a feed barn. The cows feed themselves. The only labor—moving the gates and cleaning. The roof and sides are U. S. Steel Galvanized Steel Sheets.

Put up a box silo . . . Put down your pitchfork

Pitchforks and efficiency just don't go together. Every day more and more good farmers recognize this fact and do something about it. Today box silos are appearing on farms all over the country. And for good reasons:

- **Box silos cost less to build.**
- **Box silos are easier to fill.**
- **Dairy and beef cattle feed themselves.**
- **Cut silage feeding time to minutes a day.**
- **The bonus: more free time and no work pitching silage.**

Put up a box silo. The pressure-creosoted wood will keep it up for years. One more point: when ordering your posts and lumber, make certain that they are *pressure*-creosoted *6* to *8* pounds per cubic foot.

Put up a box silo . . . put down your pitchfork.

See your dealer for our booklet, "Horizontal Box Silos," or write to us direct: United States Steel, Room 2831, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

Note: U. S. Steel does not sell pressure-creosoted wood but supplies creosote to the wood-treating industry.

Sales offices in Pittsburgh, New York, Chicago, Salt Lake City and Fairfield, Alabama

USS Creosote
TRADEMARK

ASAE Constitution Change Approved

Corporate members of ASAE voted to approve amendments to the ASAE Constitution by more than the required two-thirds of all votes cast on a ballot which closed June 5. A total of 1562 votes were cast with 1526 in favor; 34 opposed; one for proposed amendments to Article C6 and C7, but opposed to amendment to Article C16; and one in which ballot was marked "no vote."

Approval of the amendments provides for the election of a president-elect one year in advance of his automatic succession to the presidency of the Society. He will serve on the Council for three years — as president-elect, president and past-president. Provision has been made also for the election of a councilor and a member of the nominating committee for each authorized and operational Division of the Society. Each councilor will serve a two-year term on the Council. After transition is complete the Council of ASAE will consist of 11 members instead of the present number of nine. Under the new changes the number of directors to constitute a quorum during Council sessions will be increased from four to five.

The Council of ASAE has been given the authority to select a satisfactory and orderly plan for the transition from the present to the new system of electing Society officers. A possible plan was discussed during a Council session held at the Winter Meeting in Chicago, December, 1957, and explained on page 15, January issue of AGRICULTURAL ENGINEERING. Since the officers have already been selected for the year 1958-59, the plan calls for complete transition by 1961.

New Scholarship in Agricultural Engineering

Establishment of the first scholarship made available solely to agricultural engineering students at the University of Kentucky has been announced by Dr. Drayton T. Kinard, head of the university's agricultural engineering department.

G. J. Tankersley, president of Western Kentucky Gas Co. and of Kengas, Inc., liquefied petroleum gas subsidiary of the company, states that the $500 annual financial aid is to be made available immediately. Mr. Tankersley says it is his company's "keen desire to assist in the education of the young men in whose hands rest the continued progress and national prestige of Kentucky."

The student aid will be known as the Kengas, Inc., Agricultural Engineering Scholarship. Selection of the student, to be made by the scholarship committee of the College of Agriculture and Home Economics at the university, will be based on scholarship, leadership and need. The student must be a resident of the area served by the Kentucky Gas Company or Kengas, Inc. which includes 43 of the state's 120 counties.

Agricultural Engineers Honored

Four ASAE members were honored during the All-Alumni Centennial Recognition Luncheon held at the Iowa State College June 14.

Among the 100 men and women who have "made a unique contribution to the stature of Iowa State College" Centennial Citations were received by Conrad E. Frudden and Eugene G. McKibben. Mr. Frudden, of the class of 1909, is chief engineer in the Tractor Division of Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, and Dr. McKibben, newly elected President of ASAE, is a graduate of the class of 1922. He is director of the Agricultural Engineering Research Division, USDA, Beltsville, Maryland.

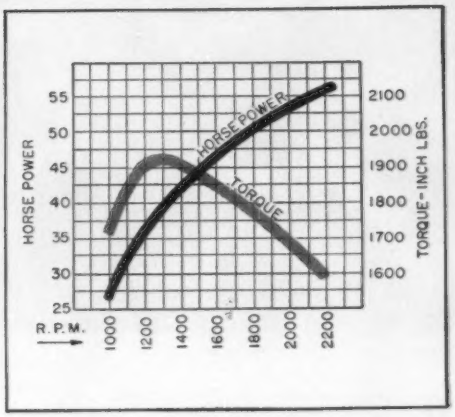
Alumni Merit Awards were received by Henry Giese of the class of 1919 and Roy B. Gray of the class of 1909, "In recognition of pre-eminent service in advancing human welfare." The citation honoring Mr. Giese reads: "An outstanding engineer, professor, humanitarian, an enthusiast for progress, for helping his fellows to grow in wisdom and stature — Professor Giese is revered and loved by all of the students who have come under his benign influence. He has helped many of them financially and spiritually toward lives of success and service. His record on the faculty demonstrates what has helped make Iowa State a great institution. His fellow alumni are proud to recognize his powerful influence for good through bestowing on him this citation for 'advancing human welfare'." Regarding Mr. Gray's service the following citation was

(Continued on page 422)

What makes *load-holding*

LUGGING POWER

in an engine?



Note the progressive, High Torque build-up as indicated on the power curve for the Model VR4D Wisconsin V-type, 4-cylinder, 56 hp. engine. Here's real load-holding Lugging Power!

Basic engineering makes the difference . . . in terms of HIGH TORQUE performance.

All Wisconsin Heavy-Duty Air-Cooled Engines are engineered and built with a HIGH TORQUE FACTOR. The resulting operating characteristics are such that the torque will *increase* under reduced engine speed. The tendency for the increasing load to slow down the engine is *resisted* with a strong "holding force" and the engine will "hang on" and make a quick power recovery under conditions that would stall most engines.

This load-holding Lugging Power is one of the important reasons why Wisconsin Engines are so well-suited to heavy-duty service . . . service that calls for the *best* an engine can deliver. In addition, *all* Wisconsin Air-Cooled Engines are of heavy-duty design and construction in all details — including Stellite Exhaust Valves and Valve Seat Inserts when specified, for extra-heavy-duty service.

Dependable Air-Cooling at temperatures up to 140° F. gives final assurance of "Most Hp. Hours" of rugged service under your conditions.

You can't go wrong if you specify "Wisconsin Power" for your equipment. Write for Bulletin 223.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

Alcoa can help you help farmers

Alcoa® researches farm applications of aluminum continuously. Take buildings . . .

In cooperation with leading agricultural colleges throughout the country, Alcoa has developed nine plans for practical pole-type buildings that can be built at savings up to 75%. More important than first cost are the long-range savings on upkeep and the increased livestock production that result from the animal comfort which aluminum brings.

You can have one complete set of these building plans free by writing for it. In addition, there's a big catalog describing these plans and giving a run-down on the savings and other advantages of building with aluminum.

If you have questions about aluminum on the farm, why not give Alcoa a chance to help you answer them? We'd like to hear from you. Meanwhile, here are some materials you'll be glad to have in your files. Write for them.

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM FARM PRODUCTS

Agricultural Division
Aluminum Company of America
2089-G Alcoa Building, Pittsburgh 19, Pa.
(Please send items checked)

- ☐ One complete set of nine pole-building StePlans.*
- ☐ *Pole Barn Plans Catalog.* Lists Alcoa plans available to farmers.
- ☐ "Right as Rain" 28-minute sound-color film on portable irrigation.†
- ☐ "Barn Raising, U.S.A." 18-minute sound-color film on pole barn construction using aluminum roofing and siding.†
- ☐ Alcoa Farm Gate literature. Facts about aluminum gates.

*Trademark of Aluminum Company of America
†Films may be borrowed for public showing. Specify films wanted.

Name_____

Address_____

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(For more facts circle No. 20 on reply card)

. . . The Second 50 Years

(Continued from page 415)

rising population trend and two world wars with the attendant pressure for greater production of the basic cereal crops with less available labor justify this engineering emphasis. And it is a tribute to our profession that so many of our farms are so well mechanized in their field operations today.

But in this period of uneasy peace in which no major powers are engaged in armed conflict we are faced nationally with large, almost unmanageable, reserves of the cereal crops and a change in emphasis away from their production. An influencing factor is the change in eating habits with a greater demand for animal proteins and less for the grain carbohydrates. This does not mean less need for agricultural engineers—rather more, but with emphasis in other fields. We must be alert to these new opportunities if we are to properly serve the industry with which we are so closely allied in the change it is currently undergoing.

Era of Farmstead Mechanization Ahead

Today a revolution is taking place on our farmsteads. Farmers are showing the same type of interest in better buildings today as they did in field mechanization during the campaign for "horseless farming" 25 years ago. This interest is expressed in four major trends, *(a)* mechanization of farm chores and materials handling, *(b)* providing proper environmental conditions for livestock, *(c)* storing and processing crops for a marketing profit and *(d)* strong emphasis on quality control of farm products. The answers to these new engineering problems lie largely in the hands of members of two of our technical divisions—Farm Structures and Electric Power and Processing.

With over 90 percent of our farmsteads electrified today we have available a source of power, the electric motor, which will play as important a role in the farmstead revolution as did the internal combustion engine in changing crop production methods.

Of the four current trends, mechanization of farm chores is probably the most important. Shortage of farm labor is the compelling force in this trend and the farmer who steps down from his tractor equipped with finger-tip control of the hydraulic mechanism is loathe to feed his cattle with a bushel basket. And no longer does he need to do his chores the hard way. Agricultural engineers have developed for his use mechanical silo unloaders and feed distribution systems, mechanical gutter cleaners, pipe lines and bulk tanks for handling milk, and water treating and distribution systems to make chores almost a push-button job. Much of the choring operation involves materials handling. For example, caring for a dairy herd of 45 cows involves handling as much as 1000 tons of materials during the year—some of it twice.

Our Society is providing leadership in sponsoring a special conference next September on the subject of farm materials handling to coordinate the engineering efforts in this field. There is need for more research by agricultural engineers in developing coordinated systems of chore mechanization and materials handling. This must include both the equipment and the structures and their efficient layout on the farmstead.

Buildings — An Integral Part

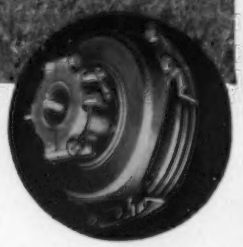
The trend to provide proper environmental conditions for more effective livestock production is particularly evident among producers of swine and poultry at the present time. Farmers want buildings which will permit production planning independent of the weather—often a controlling factor in the past.

They are interested in facilities for multiple farrowing of swine, and in cage, raised-floor and litter-type houses for poultry.

Fortunately basic research undertaken some years ago by the agricultural engineers of the U.S. Department of Agriculture in cooperation with the state agricultural experiment stations and industry has provided us with pertinent data on which to base rational housing designs. Our challenge is to develop good housing—not cheap housing—with maximum control of temperature and humidity, and designed to promote sanitation. We must incorporate the necessary equipment for maximum labor saving and take advantage of the benefits of solar heat or controlled light stimulus. The new for more agricultural engineering guidance of farmers is most urgent if farmers are to avoid costly mistakes in making major investments in buildings and equipment for livestock. Housing is the field of the agri-

(Continued on page 422)

ROCKFORD



LOC CLUTCHES
Start and Stop the PTO
While Tractor Is On the Go

Small Spring Loaded

Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

These Over-Center, Spring-Loaded clutches—when used in farm tractor LIVE POWER TAKE-OFFS—enable the harvesting unit to be controlled independently of tractor propulsion. No stops, no delays. Avoids tiresome declutching and reclutching of tractor drive. Like having an extra engine on every machine used with the tractor. Adapted for many other uses—with single, double or triple plates. But one of many types and sizes of ROCKFORD friction CLUTCHES that have been designed and built to meet specific needs. If you have a special power transmission control problem, ROCKFORD clutch engineers will be glad to help you solve it.

SEND FOR THIS HANDY BULLETIN
Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER
1325 Eighteenth Ave., Rockford, Ill., U.S.A.
Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

FARM-BUILT MOWER FOR HARD-TO-REACH SPOTS

THIS homemade rotary mower was constructed from discarded pieces of machinery by Ed Baldwin (right), who farms near Little Sioux, Iowa. A real labor and time saver, it mows ditches and other spots that can't be handled by ordinary mowers with cutter bars.

Texaco Distributor Joe Stangel supplies Texaco products and neighborly on-time deliveries to Mr. Baldwin, who finds that Texaco Fire Chief gasoline delivers superior fire-power for low cost operation. He agrees, with farmers everywhere, *it pays to farm with Texaco products.*

JERRY SHEFFELS, son of Lou Sheffels of Wilbur, Wash., talks with Texaco Consignee J. G. Stephenson. Texaco Marfak is the preferred lubricant here, because Marfak won't drip out, wash out, dry out or cake up—protects bearings against harmful dirt and grit.

JOHN H. O'NEIL of the Cheshire Oil Co., Texaco Distributors, Keene, N. H., talks about Advanced Custom-Made Havoline Motor Oil with Ann Edwards, daughter of M. A. Edwards. Havoline is their choice, because it wear-proofs tractor and truck engines for longer life.

IN ALL 48 STATES—you'll find Texaco Dealers with top-octane Texaco Sky Chief Su-preme gasoline, supercharged with Petrox, for maximum power... and famous Texaco Fire Chief gasoline at *regular* price—Havoline Motor Oil, Marfak lubricant, and other fine Texaco products.

On farm and highway it pays to use

TEXACO PRODUCTS

Texaco Products are also distributed in Canada, Latin America, and Africa.

THE TEXAS COMPANY

(For more facts circle No. 21 on reply card)

. . . The Second 50 Years

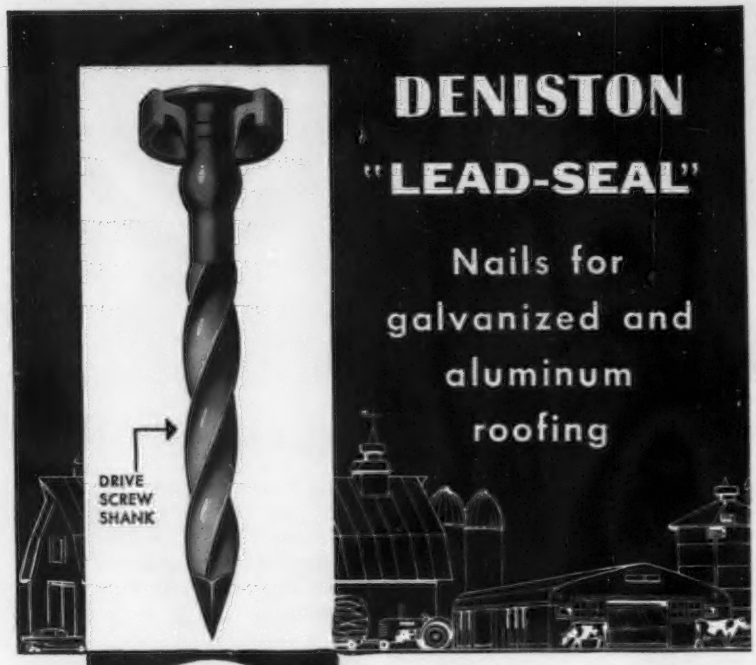
(Continued from page 420)

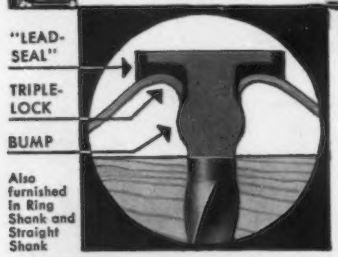
cultural engineer—not the livestock breeders or feed formulators who are attempting to specify facilities to farmers.

Methods developed by agricultural engineering research today enable farmers to safely preserve the quality of crops during long storage periods and to process them for an additional marketing profit. Crop drying and conditioning equipment make this possible. The trend to storage of crops on the farm permits controlled marketing which is of benefit to both producers and consumers. It also benefits those who handle the products in between by avoiding peak loads on facilities and manpower. Conditioning equipment also permits farmers to take advantage of new crop harvesting equipment such as the corn field shellers and peanut combines. Today cereal crops are being stored safely for five years or more —horticultural crops from one crop season to the next. Controlled-atmosphere storage of apples brings tree-ripe flavor to the consumer months after harvesting—another contribution of agricultural engineering research.

The housewife's demand for higher quality in her grocery shopping is being felt more and more at the farm level, setting up a new trend toward quality rather than quantity of production. Thus the field of quality control is broadening for agricultural engineers. The trend which started with grade "A" milk production is fast spreading to other products — pork, poultry and eggs, and fruit and vegetables. Buildings play an important part in this trend. Using eggs as an example, quality is influenced by the use of hybrid hens and carefully formulated feeds to result in eggs of uniform size and color of shell and yolk. And buildings are needed to provide controlled environment for uniform production, to maintain the health of the flock. Good equipment is needed to promote cleanliness of product and cooling for safe storage. Insulated structures with vacuum cooling vats on the farm are becoming a necessity to insure market delivery of the top quality produce demanded by the housewife.

With this rich heritage that is ours from a half century of developing our profession and with the challenges and opportunities for us that lie ahead, I am happy and proud to be an agricultural engineer. Let us live up to the hopes and aspirations of those who founded our Society. If each member does his part, even in a small way, we shall continue to grow in number and in professional standing.





All Deniston nails can be shipped in either 50 lb. or 100 lb. sturdy 3-ply corrugated color-board cartons with hand grips for easy handling.

Deniston's quality "Lead-Seal" metal roofing nail with "Triple-Lock" is heavily zinc-coated for protection against rust. It insures a permanent seal through which no moisture can penetrate, because when the hammer strikes the nail (not the lead), the "bump" and the lead are forced through the metal sheet, the sheet springs back over the "bump"—this solidly locks together the nail, lead and sheet.

Descriptive literature on Deniston "Lead-Seal" nails will be sent immediately upon request.

31 Years of Quality Nails

THE DENISTON COMPANY

4876 South Western Avenue • Chicago 9, Illinois

IN CANADA: EASTERN STEEL PRODUCTS CO., LTD., PRESTON, ONTARIO

DENISTON Lead-head ROOFING NAILS TRADE MARK

. . . News

(Continued from page 418)

given him: "A national and world leader in agricultural engineering with experience in developing mechanization around the world, Mr. Gray is recognized universally for his contribution in developing food production machinery, pest and plant disease control, tillage methods, weed control and special crop production and harvesting. He was in the forefront of the battle, during World War I, when the free world slogan was 'Food will win the war.' For his numerous and continuous contributions to progress in this area, Roy Gray amply merits this award for 'advancing human welfare'."

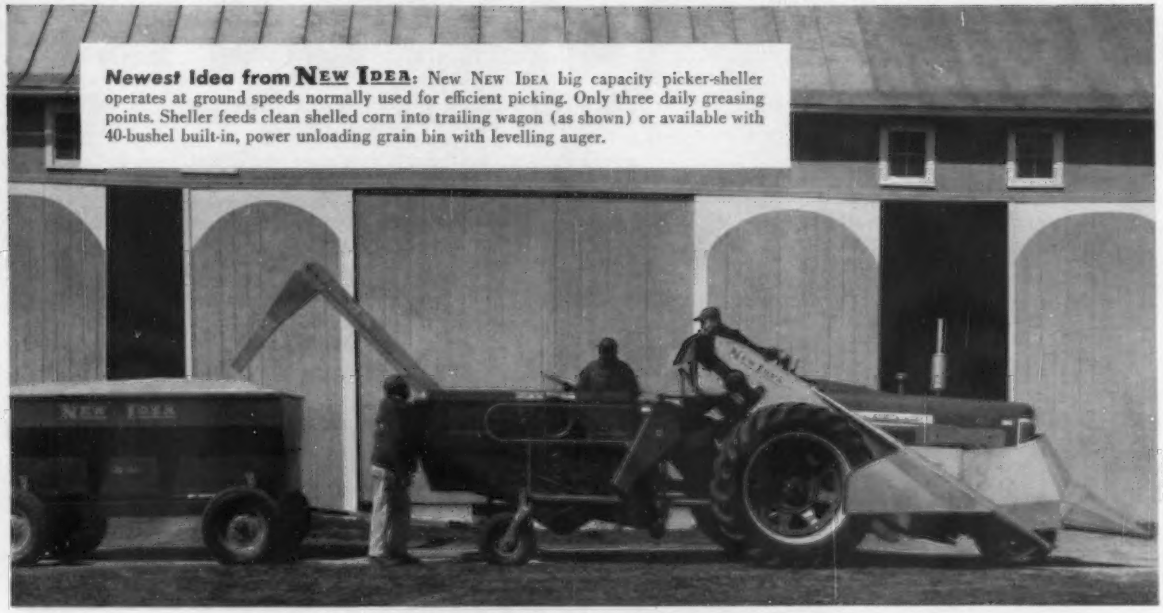
Elected Fellow

C. F. Kelly was recently nominated by the Council of ASAE to the grade of Fellow. He was born in 1906 in Lawton, North Dakota, and received both his B.S. and M.S. degrees in the field of agricultural engineering at the University of North Dakota.

Mr. Kelly's distinguished record in research in grain storage and livestock housing has had world-wide acceptance, with many of his articles being published in outstanding technical journals. Six of his manuscripts have received the ASAE Journal Paper Award.

Mr. Kelly's experience in grain research began with the USDA in 1936. One of his technical papers, USDA Cir. 637, Wheat Storage in Experimental Bins, of which he is senior author, is a standard reference on grain storage in this country and has been quoted abroad. He has made equally valuable contributions to the field of research in livestock housing, beginning his career in this capacity after his service in World War II, when he returned to employment with USDA.

In 1950 he accepted a position with the University of California where he is presently engaged in further research and the training of younger engineers.



Newest Idea from NEW IDEA: New NEW IDEA big capacity picker-sheller operates at ground speeds normally used for efficient picking. Only three daily greasing points. Sheller feeds clean shelled corn into trailing wagon (as shown) or available with 40-bushel built-in, power unloading grain bin with levelling auger.

Now you can

PICK-&-HUSK and PICK-&-SHELL

...*Both the same day*

Team up NEW IDEA's famous 2-row gathering unit with its own trailing husking bed or with the new NEW IDEA field sheller. One man can make the change-over in less than 30 minutes. The sheller operates from the tractor PTO and hugs the gathering unit for easy maneuverability. It lets you harvest your corn earlier. And only three fittings need to be greased daily . . . only ten grease fittings in all!

For the first time you have unlimited flexibility in how you harvest your corn crop. For example, you can harvest ear corn in the morning—shelled corn in the afternoon. Harvest as much as you want, *any* way you want it.

Permits Earlier Corn Harvest. With the new NEW IDEA field sheller you can harvest your corn crop earlier, leaving more time for fall plowing, tillage, and seeding. Earlier harvesting reduces field loss, since stalks and ears are not so dry. And you can frequently sell your shelled corn at high old-corn prices. Shelled corn is easier to handle, requires 50% less storage space than ear corn. With fewer wagon changes, you can harvest more corn per day!

Precision-Engineered for Long Life. The NEW IDEA field sheller was engineered to do one job and one job well: to give you gently-shelled, clean corn — with a minimum investment in equipment.

Ruggedly Built for Heavy Corn Crops. There are no delicate mechanisms in the NEW IDEA sheller that may be damaged by cobs and pieces of heavy stalks, no danger of rapid machine depreciation from harvesting corn instead of small grain. The NEW IDEA sheller will give you years of dependable service.

You can buy a NEW IDEA mounted picker or snapper, knowing that the field sheller can be added at any time. If you are one of the many thousands of farmers who already own a NEW IDEA mounted picker, plan to enjoy more versatile, more profitable corn farming by investing in the new NEW IDEA field sheller.

See it at your NEW IDEA dealer's today, or write for free literature.

For Cleanest Husked Corn, you can't beat NEW IDEA's famous mounted picker. Its trailing husking unit rides on two rubber-tired caster wheels, reducing weight on tractor wheels and permitting operation in soft fields. Husking bed has 10 extra long husking rolls, largest capacity on any mounted picker.

NEW IDEA FARM EQUIPMENT COMPANY
DIVISION AVCO DISTRIBUTING CORP.
Dept. 595, Coldwater, Ohio

Please send me the following FREE literature

- ☐ 2-row mounted picker
- ☐ 2-row pull-type picker
- ☐ 1-row pull-type picker
- ☐ 1-row pull type snapper
- ☐ 2-row mounted snapper
- ☐ New field sheller

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Street_____

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. . . Committees

(Continued from page 414)

Committee on Farm Building Construction Standards—N. H. Curry (chairman), A. A. Zander (vice-chairman), A. C. Dale, L. W. Neubauer, L. L. Boyd, J. H. Pedersen, M. L. Burgener, E. B. Moysey, D. V. Doyle, F. J. Hanrahan, J. T. Clayton, W. A. Stacey, Walter Grub

Committee on Farm Fence Construction Standards — J. S. Boyd (chairman), W. A. Stacey (vice-chairman), P. G. Strom, E. D. Merrill, R. C. Handley, G. E. Henderson, H. N. Luebcke

Committee on Farm Structures Research Needs and Statistics —Wallace Ashby (chairman), B. C. Reynolds (vice-chairman), C. K. Otis, C. H. Reed, G. T. Facer, Tappan Collins, R. I. Rich, F. G. White, W. H. M. Morris, C. E. Hervey, W. G. Kaiser, H. J Thompson

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Executive Committee —
D. L. Searls, chairman
C. W. Hall, vice-chairman
W. G. Buchinger, junior past-chairman

Steering Committee — D. L. Searls (chairman) (to June 1959), C. W. Hall, (vice-chairman) (to June 1960), H. H. Beaty (to June 1959), G. E. Henderson (to June 1959), J. B. Stere (to June 1959), K. L. McFate (to June 1960), J. W. Garland (to June 1960), Frank Andrew (to June 1960) W. H. Knight (to June 1960), P. R. Bakes (to June 1961), C. W. Hall (to June 1961), M. B. Penn (to June 1961), L. J. Endahl (to June 1961), J. L. Calhoun (to June 1962), Price Hobgood (to June 1962), E. F. Olver (to June 1962), Karl Norris (to June 1962), H. J. Hansen (to June 1963), S. M. Henderson (to June 1963) J. H. Oliver (to June 1963), R. W. Kleis (to June 1963)

Program Committee — L. J. Endahl (chairman), M. H. Lloyd, Price Hobgood, D. W. Works, J. L. Calhoun, C. W. Hall, W. G. Buchinger, K. L. McFate, G. W. Isaacs, D. L. Searls

Committee on Feed Handling — C. K. Otis (chairman), B. A. McKenzie (vice-chairman), W. G. Buchinger, B. P. Hess, J. H. Oliver, L. A. Brooks, I. P. Blauser, Marvin Nabben, Murray Forth, R. P. Prince, R. M. Peart, R. W. Kleis

Committee on Animal Shelter Ventilation (Joint with Farm Structures Division) — H. J. Hansen (chairman), W. F. Millier (vice-chairman), M. L. Burgener, R. J. Bugbee, F. P. Stephan, H. V. Walton, H. R. Wakefield, T. E. Bond, Nolan Mitchell, H. J. Thompson, M. H. Lloyd

Committee on Bulk Milk Cooling Systems — C. N. Turner (chairman), M. C. Ahrens, L. F. Charity, D. C. Sprague, C. W. Hall, A. K. Gillette

Committee on Farm Wiring — H. S. Pringle (chairman), M. O. Whithead, M. H. Lloyd, U. F. Earp, G. P. Barrington

COMMITTEES — EDUCATION AND RESEARCH DIVISION

Executive Committee —
G. E. Spencer, chairman
E. T. Swink, vice-chairman
J. Roberts, junior past-chairman

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Committee on Research — G. W. Giles (chairman), R. E. Stewart (vice-chairman), R. R. Poynor, H. M. Gitlin, W. M. Carleton, C. S. Morrison, L. W. Bonnicksen, J. W. Martin, C. W. Hall, R. R. Mauney, E. A. Silver

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Weyerhaeuser 4-Square Kiln-dried Lumber and other building products are scientifically produced to exacting standards. They give trouble-free performance, lasting satisfaction, and economical construction.

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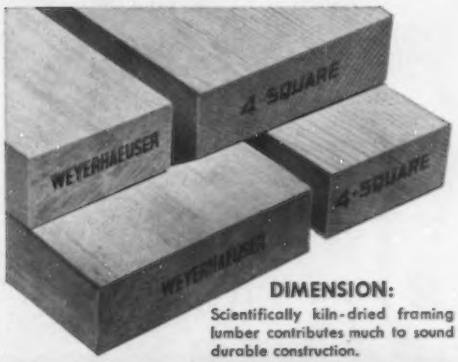
BOARDS: Seasoned before surfacing to size. Available in many species and grades.



DIMENSION: Scientifically kiln-dried framing lumber contributes much to sound durable construction.

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LUMBER AND BUILDING PRODUCTS

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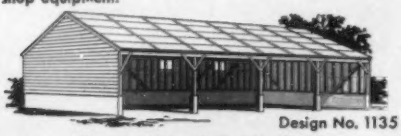
For farmers who need a double garage and workshop under one roof, here is a roomy, well lighted service building. Plans provide for an overhead hoist, plus shop equipment.



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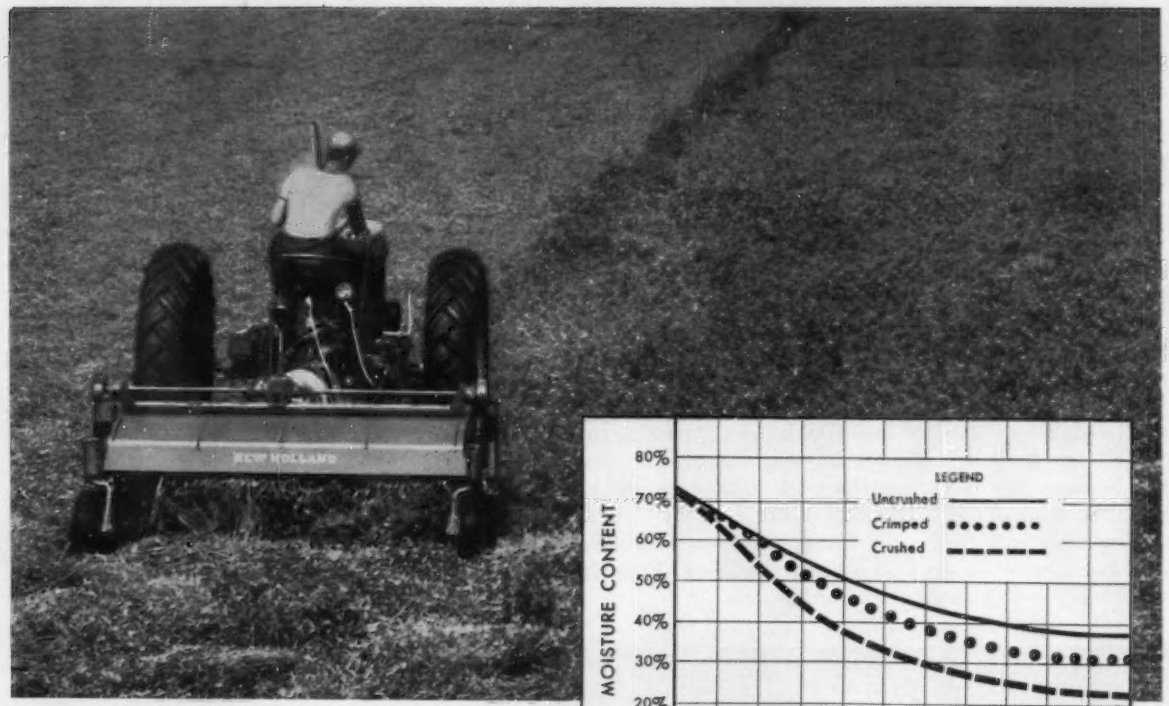

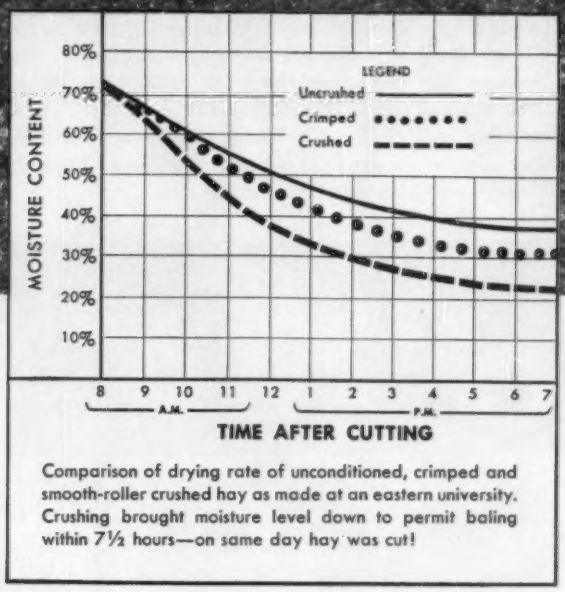

Comparison of drying rate of unconditioned, crimped and smooth-roller crushed hay as made at an eastern university. Crushing brought moisture level down to permit baling within 7½ hours—on same day hay was cut!

Here's why crushing conditions hay best

University studies show smooth-roller crushing steps up hay's drying speed faster than crimping. Gentler action preserves leaves and blooms to make richer hay.

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Conditioning speeds drying of the stems—which in unconditioned hay dry only half as fast as the leaves. By bruising or abrading the fibrous, wax-coated skin of the stems, conditioning lets the trapped moisture escape. As a result, stems dry faster . . . baling can be started sooner—*before* leaves become wilted and are easily stripped and lost.

Although either of the two most commonly used methods of conditioning will speed drying, recent studies have shown a considerable difference in their effectiveness.

Crimping

Stems are "crimped" at intervals: moisture escapes only at those points along the stems where the skin has been split. Crimping, thus, conditions the hay only partially.

Smooth-roller crushing

Hay passes between two large smooth rollers which subject stems to an even pressure from butt to bloom—even when stems go through sideways. Moisture escapes through ruptured skin along *entire length* of the stem—making for faster drying.

Crushing "tenderizes" stems

Another advantage of crushing is that it makes stems softer and more pliable. Crushed hay is thus more tender as well as leafier . . . more palatable to livestock.

The New Holland "440" Mower-Crusher has extra-large smooth rollers; both driven. It conditions hay completely for fastest field curing . . . preserves nutrient-rich leaves and blooms. New Holland Machine Company Division of Sperry Rand Corporation, New Holland, Pa.

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5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
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4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
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The following is a list of recent applicants for membership in the American Society of Agricultural Engineers. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

Beasley, Eustace O. — Res. instructor of agr. eng., North Carolina State College, Raleigh, N. C.

Benz, Raymond C.—Ext. agr. engr., Agr. Ext. Service, P.O. Box 391, Little Rock, Ark.

Brentzel, Richard E.—Layout draftsman, Habco Mfg. Co. (Mail) 1615 B St., Columbus, Nebr.

Cornelison, Alexander H.—Soil conservationist, District Public Works Office (Mail) 2536 Manoa Rd., Honolulu, T. H.

Fontecchio, Stephen T.—410 Hillview Place, Ithaca, N. Y.

Hanks, John B.—District mgr., New York Central System, Michigan Central Terminal, Detroit 16, Mich.

Hutchinson, Allen R. — Treasurer, Hutchinson Tractor Equipment Co. (Mail) P.O. Box 3066, Orlando, Fla.

Kole, Gerald N. — Draftsman, John Deere Des Moines Works (Mail) c/o Mel-Ray Mobile Home Park, Ankeny, Iowa

Langa, John Matthew—Irrigation technician, Hawaiian Commercial & Sugar Co. Ltd., Puunene, Maui, T. H.

Lechner, Fred G. — Asst. prof. of agr. eng., Cornell University, Riley-Robb Hall, Ithaca, N. Y.

Lovett, Walter M.—Rural engr., Georgia Power Co., Athens, Ga.

Luke, James S. — Civil engr. (SCS) USDA (Mail) P.O. Box 298, Lake Placid, Fla.

Marvin, R. Paul—Instructor of agr. eng., University of Minnesota, St. Paul Campus, St. Paul 1, Minn.

Miller, George W. — Agr. eng. advisor, The Ford Foundation (Mail) The State Agr. Institute, Pyinmana, Burma

Smart, Walter E. — District mgr., Fafnir Bearing Co., 7136 W. State St., Milwaukee 13, Wis.

Watkins, Rupert W. — Res. instructor of agr. eng., North Carolina State College (Mail) P.O. Box 263, Fuquay Springs, N. C.

TRANSFER OF MEMBERSHIP

Bornman, P. J. U.—Lecturer, Barberton Technical Institute; Barberton Iron & Steel Ltd. (Mail) P.O. Box 23, Barberton, Transvaal, S. Africa (Affiliate to Associate Member)

Gates, Cecil R. — Agr. engr., Pittsburgh Forgings Co. (Mail) 211 Marble St., Aliquippa, Pa. (Affiliate Member to Member)

Sawin, Henry W.—Sr. des. engr., Peerless Pump Div., Food Machinery and Chemical Corp. (Mail) 1506 N. Kenmore Rd., Indianapolis 10, Ind. (Associate Member to Member)

STUDENT TRANSFERS

Allard, Kermit O.—Student, Univ. of Maine, University Cabin No. 2, Orono, Me.

Allen, Ronald R.—Student, Kansas State College, 314 Campus Cts., Manhattan, Kans.

Andrews, John M.—Student, Kansas State College, H-11 Jardine Terrace, Manhattan, Kans.

Arble, William C. — Student, Michigan State Univ., 1025-B Birch Rd., E. Lansing, Mich.

Bakker, Donavon L. — Student, Iowa State College, 1267 Stevenson, Friley Hall, Ames, Iowa

Ball, Ronald L.—Student, South Dakota State College (Mail) 915 9th St., Brookings, S. D.

Barker, Harold G. — Student, North Carolina State College (Mail) R.R. 6, Box 434, Statesville, N. C.

Bartels, Ralph W. — Iowa State College (Mail) 690 Jefferson Ave., Elgin, Ill.

Bergevin, Duane B.—Student, State College of Washington (Mail) 1400 Maiden Lane, Pullman, Wash.

Bigbee, Marvin L.—Student, Iowa State College (Mail) 321½ Ash Ave., Ames Iowa

Bingley, George W. — Student, Michigan State Univ., 916 C Walnut Lane, E. Lansing, Mich.

Boning, John F.—Student, Univ. of Nebraska (Mail) 3601 Apple St., Lincoln, Nebr.

Bonthuis, James E.—Student, Iowa State College (Mail) 809 Burnett, Ames, Iowa

Breitung, David A. — Student, South Dakota State College (Mail) 120 8th St., Brookings, S. D.

Bryan, William W. — Student, Texas A & M College (Mail) 712A Banks, Bryan, Texas

Camp, Carl R., Jr.—Student, Alabama Polytechnic Institute, 3117 Magnolia Hall, Auburn, Ala.

Carpenter, Jimmy L.—Student, Iowa State College (Mail) 726 Carroll Ave., Ames, Iowa

Carpenter, Philip, Jr. — Student, Iowa State College, Box 31 Terrace Park, Ames, Iowa

Childress, Charles E.—Student, Univ. of Arkansas (Mail) 15 Williams, Fayetteville, Ark.

Clemson, Jan—Field rep., Farm Service Div., British Columbia Electric Railway Co., Ltd. (Mail) P.O. Box 1353, Abbotsford, B.C., Canada

Clyma, Wayne—Student, Oklahoma State Univ. (Mail) 315 S. Duck, Stillwater, Okla.

Danielson, Charles O. — Student, South Dakota State College (Mail) Vienna, S. D.

Davies, Cecil D.—Student, Kansas State College (Mail) 1626 Laramie, Manhattan, Kans.

DeGraff, Robert P.—Student, Purdue Univ., Hall X, Box 122, W. Lafayette, Ind.

Delay, Robert R.—Student, Iowa State College, 4451 Chamberlain, Friley Hall, Iowa State College, Ames, Iowa

Donley, David L.—Student, Penn State Univ. (Mail) R.R. 1, Greersboro, Pa.

Doty, Coy W. — Student, Alabama Polytechnic Institute (Mail) 14 B Graves Apts., Auburn, Ala.

Downing, Charles M.—Student, Michigan State Univ., 814-B Birch, E. Lansing, Mich.

Dunlap, James H. — Student, Univ. of Maine (Mail) R.R. 1, Skowhegan, Me.

English, Stephen C. — Student, North Carolina State College (Mail) 615 Wayne Dr., Raleigh, N. C.

Evans, Max L.—Student, Purdue Univ. (Mail) 227 Sheetz St., W. Lafayette, Ind.

(Continued on page 432)

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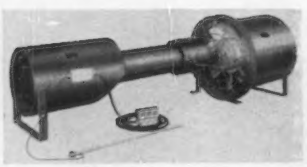

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With the DRY-O-MATION System of grain conditioning the supplemental heater attached to the fan automatically and instantaneously supplies heat to maintain natural drying conditions that are always favorable.

DRY-O-MATION assures uniform conditioning of every layer of grain in every part of the bin. Less shrinkage; no over-drying. Field-tested DRY-O-MATION makes the step from field to storage bin one continuous operation that saves time and money. It produces clean, premium quality grain every time. We cordially invite you to become fully acquainted with the simple, practical and low costing advantages of DRY-O-MATION. Write us today for your free copy of the DRY-O-MATION Story.

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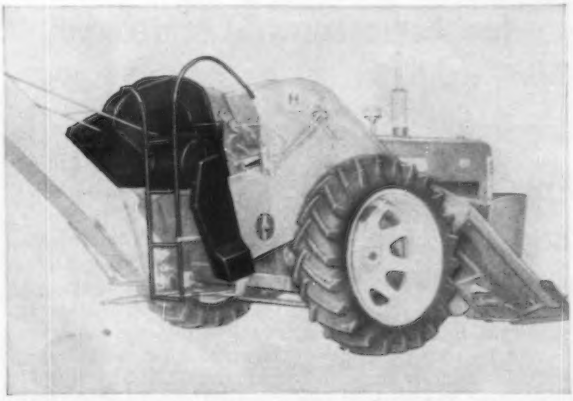
with great corn-saving McCORMICK® 2-MH



New McCormick No. 10 sheller attachment quickly mounts on corn hopper of McCormick 2-MH picker . . . clean-shells at peak capacities of 1,500 to 2,000 bushels a day. Sealed bearings make it practically service free.

Now, farmers can harvest ear or shelled corn with the *same* McCormick 2-MH picker! Just add new No. 10 corn sheller attachment to field-shell 1,500 to 2,000 bushels a day! And *exclusive* IH design enables a farmer to switch between ear and shelled corn harvest in 10 minutes—*without* removing the sheller unit from his picker.

This 2-in-1 machine makes it practical to harvest feed corn on the cob, or field-shell cash corn the *same* day. Here's a profitable way to reduce field losses, labor costs, storage needs, and save custom sheller-men's fees to boot! And the comparatively low cost of this new unit brings field shelling within the reach of all McCormick 2-MH owners.

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(For more facts circle No. 25 on reply card)

. . . Applicants

(Continued from page 430)

Falgoust, Lester B. — Student, Louisiana State Univ. (Mail) Box 12199, Baton Rouge, La.

Finner, Marshall F.—Student, Univ. of Wisconsin (Mail) 202 Agr. Engr. Bldg., Univ. of Wisconsin, Madison, Wis.

Fisher, Guy D. — Student, Washington State College (Mail) Oroville, Wash.

Friedman, Herbert R. — Student, Oklahoma State Univ. (Mail) 305½ "A" East Va., Stillwater, Okla.

Fritsch, Richard G.—Student, Washington State College (Mail) 403 East Division, Mount Vernon, Wash.

Gallinger, Robert J. — Student, Cornell Univ. (Mail) 608 E. State St., Ithaca, N. Y.

Gilchrist, Herbert G. — Student, Univ. of Saskatchewan (Mail) Box 107, Univ. P.O., Saskatoon, Sask., Canada

Gilman, Francis E.—Student, Univ. of Maine (Mail) R.R. 1, Old Town, Me.

Glantz, Marvin E.—Student, Univ. of Nebraska (Mail) 5000 Lowell, Lincoln 6, Nebr.

Glick, David D.—Student, Ohio State Univ. (Mail) 110 E. Lane Ave., Columbus 1, Ohio

Gober, Charles C.—Student, Texas A & M College (Mail) Box 2456, College Station, Tex.

Gruenhagen, Eppler W. — Student, Purdue Univ. (Mail) 131 Pierce St., W. Lafayette, Ind.

Hardy, George L., Sr. — Student, Clemson College (Mail) Box 4009, Clemson, S. C.

Heath, Harold R. — Student, Univ. of Florida (Mail) 1728 NW 1st Ave., Gainesville, Fla.

Heim, Fred J., Jr.—Student, Univ. of Wisconsin (Mail) 118 W. Johnson St., Madison 3, Wis.

Higginbotham, Otis K. — Student, Oklahoma State Univ. (Mail) 2318 N. Washington, Stillwater, Okla.

Housley, Donald L.—Student, Univ. of Idaho (Mail) Apt. 7C, W. 6th Village, Moscow, Ida.

Huber, Kenneth L. — Student, South Dakota State College (Mail) 612 Medary Ave., Brookings, S. D.

Huber, Norman C.—Student, Univ. of Wisconsin (Mail) 119 Merrill Crest Dr., Madison 5, Wis.

Ibbitson, Loring C. — Student, Texas A & M College (Mail) 1101 Park Place, College Station, Tex.

Ice, Mervin R. — Student, Purdue Univ. (Mail) 14 N. 9th St., Lafayette, Ind.

Ifft, Theodore H.—Student, Penn State Univ. (Mail) R.R. 6, Mercer, Pa. c/o Mr. H. H. Royle

Indermuhle, Vernon C.—Student, Univ. of Idaho (Mail) 3824 N. Cole Rd., Boise, Idaho

Jennings, William J. — Student, Virginia Polytechnic Institute (Mail) R.R. 1, Nathalie, Va.

Johnson, Earl C. — Student, North Dakota Agricultural College (Mail) Christine, N. D.

Johnson, Glen Arnold — Student, North Dakota Agricultural College (Mail) B-31 North Court NDAC, Fargo, N. D.

Johnson, Robert B.—Student, Univ. of Wisconsin (Mail) 1515 Monroe St., Madison 5, Wis.

Johnson, Wayne M. — Student, Texas A & M College (Mail) R.R. 1, Box 44, Groveton, Tex.

Jones, Lawrence D. — Student, Purdue Univ. (Mail) 427 State St., W. Lafayette, Ind.

Keeter, Frederick — Student, Oklahoma State Univ. (Mail) 901 College, Stillwater, Okla.

King, Larry G.—Student, State College of Washington (Mail) 2-B S. Fairway, Pullman, Wash.

Klouda, Alvin E.—Student, Iowa State College (Mail) 502 "A" Ave., S., Mt. Vernon, Iowa

Lambert, Howard P.—Student, Penn State Univ. (Mail) YMCA, Racine, Wis.

Lambert, Jerry R.—Student, Univ. of Florida (Mail) 741 SW 2nd Ave., Gainesville, Fla.

Lamoreau, Paul D., Jr. — Student, Univ. of Maine (Mail) 9 Hillside St., Presque Isle, Me.

Larder, Richard A.—Student, Michigan State Univ. (Mail) R.R. 4, Charlotte, Mich.

Leen, Mark C.—Student, Iowa State College (Mail) R.R. 1, Jackson, Minn.

Lemmon, Norman F. — Student, North Dakota Agricultural College (Mail) R.R. 2, Detroit Lakes, Minn.

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O'Donovan, Wilbur W. — Student, Cornell Univ. (Mail) 712 E. Buffalo St., Ithaca, N. Y.

Olson, Sterling P. — (SCS) USDA, Bridgeport, Nebr.

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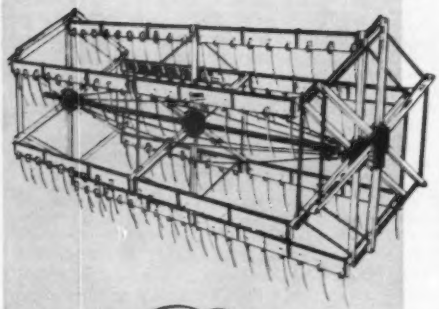

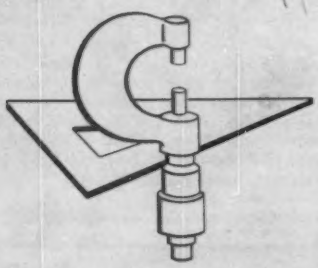

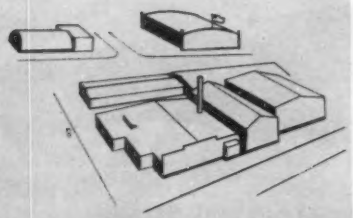

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EVENTS CALENDAR

July 20-26 — 15th Annual *National Farm Safety Week,* co-sponsored by the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill., and U.S. Department of Agriculture.

August 12 - 14 — *Cotton Production and Mechanization Conference,* Brownsville, Texas. Details may be obtained by writing Farm Equipment Institute, 608 S. Dearborn St., Chicago 5, Ill.

August 21-22 — *16th National Plowing Contest and Conservation Exposition,* The Hershey Estates, Hershey, Pa. Contest rules may be obtained from Leland H. Bull, General Chairman, NPCCE, 127A South Office Bldg., Harrisburg, Pa.

September 3-20 — International Engineering "Package" Meetings — *Fifth Convention of the Pan American Federation of Engineering Societies (UPADI),* Sept. 3-6, Montreal, Canada. *Sectional Meeting of the World Power Conference,* Sept. 7-11, Montreal, Canada. Study Tour, Sept. 11-14, to St. Lawrence River Navigation and Power Projects, to Niagara Falls, to the Nuclear Power Station at Shippingport and to New York City. *Sixth International Congress on Large Dams,* Sept. 15-20, Statler Hotel, New York, N. Y. For further details contact G. A. Hathaway, chairman, 4316 Van Buren St., University Park, Hyattsville, Md.

September 17-19—*Farm Materials Handling Conference,* Iowa State College, Ames, sponsored by American Society of Agricultural Engineers. For further details see page 378, this issue, or write ASAE, 420 Main St., St. Joseph, Mich.

September 22-24 — *7th Annual Meeting of Standards Engineers Society* at Benjamin Franklin Hotel, Philadelphia, Pa. For further details contact F. F. Van Atta, 1916 Race St., Philadelphia 3, Pa.

September 29 - October 1—*Farm Equipment Institute Convention,* Atlantic City, New Jersey. For information write FEI, 608 S. Dearborn St., Chicago 5, Ill.

September 29 to October 4 — *Fifth International Congress of Agricultural Engineering* to be held in Brussels, Belgium. The aim is to stimulate the science and the techniques of agricultural engineering, as well as the use of these techniques; and to coordinate scientific research and techniques in the fields related to agricultural engineering. Registration information may be obtained by writing to M. Nestor Laret, Avenue des Combattants, 69, Gembloux, Belgium.

October 5-7 — 5th Annual *National Power Use Conference,* Hotel Statler, Buffalo, N. Y. For details write Inter-Industry Farm Electric Utilization Council, Inc., P.O. Box 577, Washington 4, D.C.

October 19-22 — Annual Conference of the *Soil Conservation Society of America,* to be held in the Auditorium of Asheville, N. C. The theme is Land and Water for Tomorrow's Living. For further information contact SCSA, 838 5th Ave., Des Moines, Ia.

May 29 - June 7, 1959 — *RiLa* arranged by Swedish Federation of County Agricultural Societies and billed to be the largest agricultural show to be held in Sweden since 1946. Its aim is to give presentation of Sweden's mechanized farming and high-quality livestock breeding, and also the country's agriculture as an export-import industry. Further details may be obtained from The Swedish-International Press Bureau, Brunkebergstorg 14, Stockholm, Sweden.

. . . News

(Continued from page 422)

Russian Tours Planned

A news release by the Foreign Agricultural Service announces an exchange of agricultural observers between the United States and Soviet agricultural groups with delegations to be sent from the United States to the USSR this summer and in the early fall. Russia will send a similar group to the United States. In 1959 three additional teams will be exchanged.

An agreement announced January 27 provides for a general program of exchange in cultural, technical and educational fields. The delegation exchange plan has been described by the U.S. Department of Agriculture as "a significant first step in the improvement of mutual understanding between the people of the United States and the USSR."

W. W. Donnan, USDA principal drainage engineer and a member of ASAE will be included in the Soil and Water group to visit the Soviet Union, leaving July 10. The group visiting in the interest of mechanization of agriculture to observe farm mechanization practices in representative farming areas will leave on August 18 and will be made up entirely of ASAE members, including Walter M. Carleton, assistant director, Agricultural Engineering Research Division, ARS, USDA, Beltsville, Md.; Arthur W. Cooper, director, the National Tillage Machinery Research Laboratory, USDA, Auburn, Alabama; Lloyd Hurlbut, head, Department of Agricultural Engineering, University of Nebraska; Carl Hall, Department of Agricultural Engineering, Michigan State University; Karl D. Butler, farm counselor, Avco Mfg. Co., Ithaca, New York, and Wayne H. Worthington, Director of Research, John Deere Research Development Center, Waterloo, Ia.

Victor L. Stedronsky, agricultural engineer, Agricultural Research Service, Mesilla Park, New Mexico, an ASAE member, will be among those who will visit the country in the interest of cotton growing and plant physiology, to leave on September 1.

As the first USDA-sponsored group, the delegation selected from USDA and Land Grant institution specialists in specific fields will visit Russian farms, research stations and institutions, familiarizing themselves with agricultural developments that have taken place in the USSR. Groups from both countries will be seeking specific scientific or technical knowledge.

Radiation Papers Requested

The ASAE Committee on Radiation is soliciting papers on the application of nuclear or accelerator radiation to agricultural engineering problems, for presentation at the 5th Nuclear Congress, to be held at Cleveland, Ohio, April 5 to 10, 1959. A 300 to 500-word summary of the paper should be submitted to the committee chairman, J. K. Jensen, John Deere Research and Engineering Center, P.O. Box 270, Waterloo, Iowa, prior to Sept. 30, 1958. Any application of nuclear science as applied to agricultural engineering will be considered to be a suitable subject.

Special Soil and Water Meeting

A special Soil and Water Meeting has been arranged by the Pacific Coast Section, to be held on Oct. 9-12 at Riverside, Calif.

Plans are under way for a tour of the San Dimas Research Center, U.S. Forest Service, where significant field experiments on watershed management are being conducted. A lunch and meetings on watershed management and flood control will be held at the Research Center's Tanbark Flat facility.

ASAE members are requested to submit for consideration titles of papers they should like to have presented, particularly on irrigation, drainage, salinity, soil conservation, flood control and watershed management. Titles should be sent to A. F. Pillsbury, Department of Irrigation and Soil Science, University of California, Los Angeles 24, Calif.

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Owens, Carl E., Jr. — Student, North Carolina State College (Mail) 610 Holden St., Raleigh, N. C.

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Smith, Samuel W. — R.R. 2, Carlisle, Ky.

Stipe, Dennis R. — R. 5, Hico, Texas

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PERSONNEL SERVICE BULLETIN

NOTE: In this bulletin, the following listings current and previously reported are not repeated in detail; for further information see the issue of AGRICULTURAL ENGINEERING indicated. "Agricultural Engineer" as used in these listings is not intended to imply any specific level of proficiency or registration as a professional engineer. Items published herein are summaries of mimeographed listings carried in the Personnel Service, copies of which will be furnished on request. To be listed in this Bulletin, request form for Personnel Service listing.

POSITIONS OPEN — JANUARY — O-478-769. FEBRUARY—O-12-801, 48-803. March—O-37-804, 72-805, 78-806, 83-807. APRIL—O-97-809, 122-811, 121-812, 120-813. MAY—O-129-814, 147-815, 69-817, 132-818, 132-819, 154-820, 158-821, 159-822. JUNE—O-189-823, 194-824, 199-825, 200-826.

POSITIONS WANTED — JANUARY — W-447-58, 410-59, 381-60, 466-61, 484-62, 485-63, 3-1, 4-2. FEBRUARY—W-31-5, 33-6. MARCH—W-36-8, 62-9, 46-10, 80-12. APRIL—W-47-13, 77-14, 98-15, 102-16, 107-17, 94-18, 106-19. MAY—W-25-20, 127-21, 128-22, 143-23, 151-24. JUNE—W-164-25, 175-26, 186-27, 79-28, 192-29, 172-30, 205-31.

NEW POSITIONS OPEN

AGRICULTURAL ENGINEER, assistant professor, to teach household mechanics in a land grant university in the East. Some research and/or extension in same field. BSAE or equivalent and MS. Farm background and some experience in teaching or extension. Major interest in household and farmstead equipment. Strong interest in student development. Opportunity to direct program of agricultural engineering department in its cooperation with the College of Home Economics in teaching, research and extension. Salary $6210 or higher, depending on experience and qualifications. O-256-827

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AGRICULTURAL PROMOTION SPECIALIST for development, sales or service in farm structures field with manufacturer or trade association, preferably in Midwest or West. Married. Age 39. No disability. BS in agriculture (rural economics) Purdue University, 1941. With structural paper manufacturer since graduation except for 4 years in governmental and military service. Sales 10 years. In charge of agricultural-horticultural application development, 2 years. Available August 1. Salary $10,000 plus. W-197-32

AGRICULTURAL ENGINEER for sales or management in farm structures, with manufacturer or processor. Any location. Married. Age 40. No disability. BSAE, 1947; MSAE, 1948, Iowa State College. Experience as owner and operator of a dairy farm. Teaching, 5 years. Sales and promotion work with building materials manufacturers, 2½ years. Building contracting and hog production business, 2½ years. Manager of farm building division of specialized equipment manufacturer, 2 years. War enlisted service in Army, 3 years. Available now. Salary open. W-246-32

AGRICULTURAL ENGINEER for extension, teaching, or research in power and machinery or product processing with college or experiment station, preferably in the West. Married. Age 27. No disability. BSAE, 1953, University of Idaho. Certificate of competence in meteorology, UCLA, 1954. Work on MSAE nearly completed. Experience one summer as student engineer, three summers as maintenance man for a packing company. Teaching one year. Commissioned service in USAF 4 years, as weather forecaster. Available Sept. 1. Salary open. W-223-34

AGRICULTURAL ENGINEER for research in soil and water with public service or industry, preferably in Southwest. Single. Age 21. No disability. BSAE, 1958, University of Arizona. Dairy farm background. One summer in irrigation research with ARS, USDA. Member of Air National Guard. Particularly interested in opportunity to work toward MSAE. Available now. Salary open. W-251-35

AGRICULTURAL ENGINEER for design, teaching or research in power and machinery with college or manufacturer, in Southwest, West or Mountain area. Married. Age 31. No disability. BSAE, 1950, Alabama Polytechnic Institute. Farm background. Experience as veterans vocational agriculture instructor, 5 months. Fertilizer salesman one year. Assistant service station manager for Georgia division of large oil company 10 months. Engineer with harvester manufacturer one year. Extension agricultural engineer, cotton ginning specialist, nearly 2 years. Military service over 4 years. Available August 1. Salary $6,000. W-252-36

AGRICULTURAL ENGINEER for design, development, research, sales, service or management in power and machinery or farm structures with manufacturer in Midwest. Limited travel. Married. Age 31. BSME, 1951, Iowa State College. Farm background. Sales trainee with farm equipment manufacturer 5 months. Project engineer with steel fabricator over 6 years. Military service 18 months with Army Corps of Engineers. Available now. Salary $10,000. W-244-37

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Wolka, Allen D.—Student, Purdue Univ. (Mail) R.R. 1, Vallonia, Ind.

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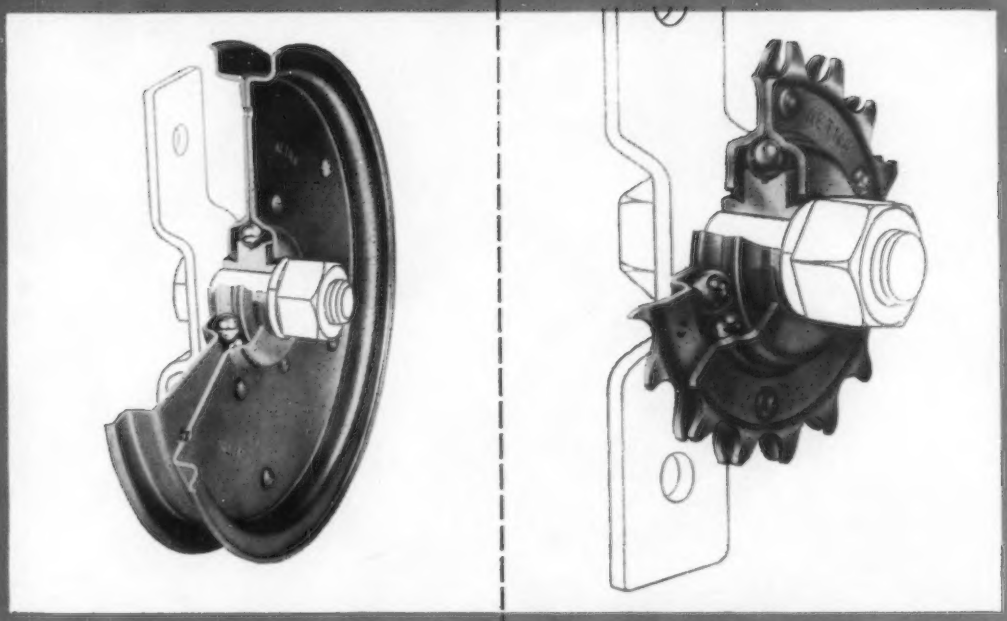

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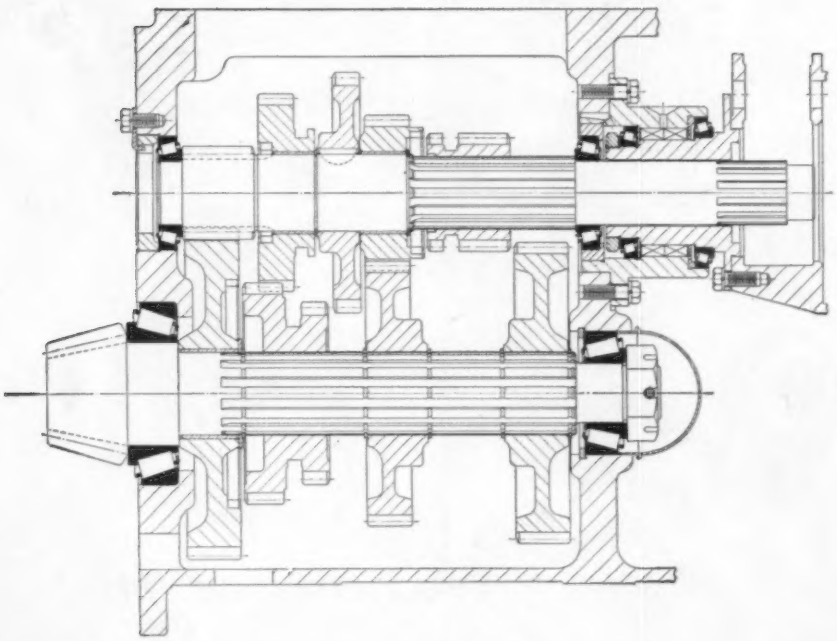
Highest capacity at lowest cost in new Minneapolis-Moline tractor transmission

Timken® bearings simplify gear reduction unit, give greater rigidity for longer life



WITH a simpler design, Minneapolis-Moline engineers achieved high capacity for the transmission of their new MM 5-Star tractor. And they did it at lowest possible cost by using Timken® tapered roller bearings in the gear reduction unit.

Using Timken bearings enabled them to apply the effective spread principle at the bevel pinion. The design of the bearing at this point is such that the effective center of the bearing's load-carrying capacity is close to the bevel pinion center line, providing the ultimate in rigidity at this vital point. Throughout the transmission, Timken bearings assure maximum rigidity, keep all gears in alignment under rugged farm working conditions. No other bearings can give equal capacity at the price.

Simpler and more compact designs are big reasons why more and more engineers are standardizing on Timken bearings for rugged farm machinery. Full-line contact between rollers and races gives Timken bearings extra load-carrying capacity. Timken bearings keep shafts concentric with their housings—make closures more effective. Dirt stays out; lubricant stays in. And because Timken bearings practically eliminate friction, they save power and cut fuel consumption.

Agricultural engineers find answers to three big problems with Timken tapered roller bearings: 1) Combination loads; 2) dirt; 3) ease of operation. Timken bearings are a precision product—both by design and manufacture. We even make our own steel. No other American bearing manufacturer does.

For help in designing new bearing applications, contact our sales engineers or write to The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".

NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭
BEARING TAKES RADIAL ▯ AND THRUST—▯— LOADS OR ANY COMBINATION

The farmer's assurance of better design

Tapered Roller
TIMKEN BEARING
EQUIPPED

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